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Summer No 48 — November, 1985/$2.75*

EARTH GARDEN

THE PISE PRIMER

- Bob Rich's guide to rammed earth building, tools and techniques, Hard Times pise, rammed earth renaissance, mudbrick render, animals shelters, natural timber stains, ferrocement water tank.
- *The search for water* — hand-dug wells, rock drilling, waterwheel pump.
- Energy Pulse, windfarms, buying an energy system, renewable light.
- *Plus* — Looking for land (a New Settlers' guide), multiple occupancy, growing firewood, sushi and sashimi, compost muncher, refrigerator smoker, land lines, access, letters, more.

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KEITH SMITH

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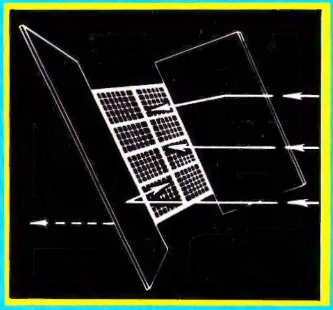

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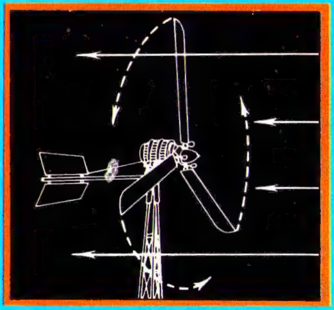

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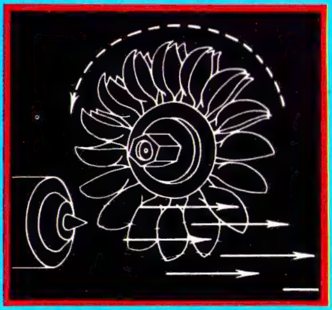

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EARTH GARDEN 48

Earth Garden, started in 1972, is the original Australian journal of self-reliance. It is intended as a friendly forum of practical ideas, shared knowledge, sources and alternatives.

It's about putting a roof over your head, growing your own food, using alternative energy and surviving — and thriving — in the city or the bush and the inner changes which follow when you are in tune with nature.

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Illustrations by Elaine Norling.

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The cover

Front: Top left: Rammed earth beach house, owned by Eric Carlin, by the Indian Ocean at Prevally Park, WA, built by Ramtec Pty Ltd of Perth. Photo by Stephen Dobson. *Right:* Dieter Fahland with his waterwheel pump at Camerons Pocket, Queensland. *Below left:* Bob Rich, Mudsmith, pictured with wooden tamper or 'dolly' used in rammed earth building. *Right:* Mellow dining room walls of clay and aggregate in a two-storey house at Cottesloe, WA, built by Ramtec. Photo Stephen Dobson. *Back:* Bear Castle at Yan Yean, Victoria, built of earth in the 1840s, from John Archer's *The Home Building Experience.*

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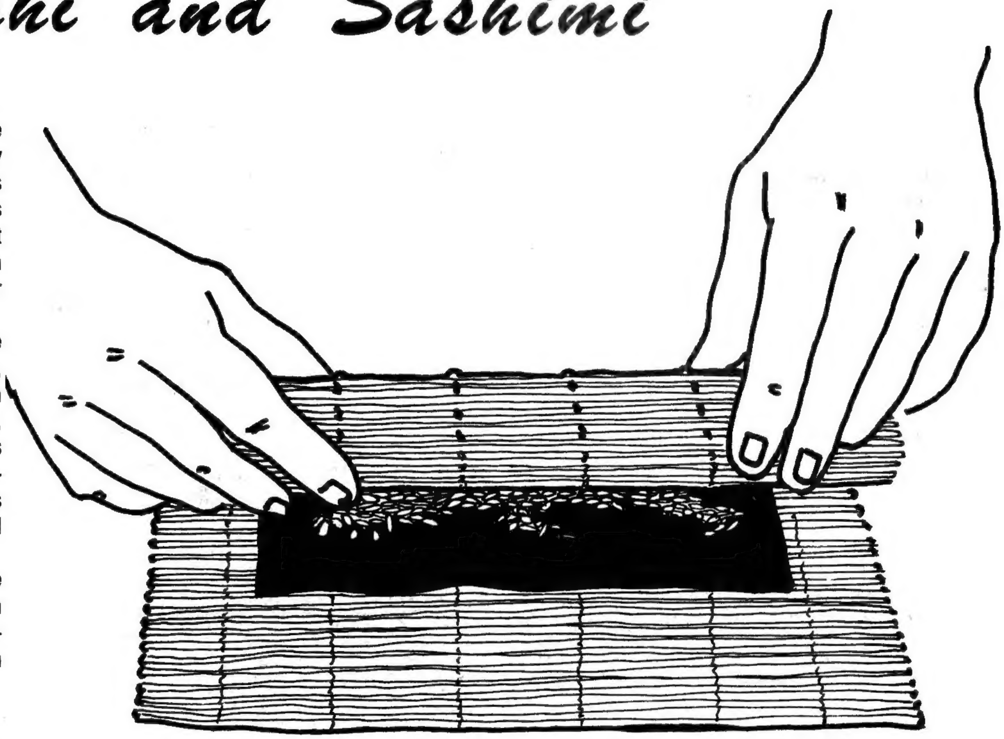
Sushi and Sashimi



Traditional Japanese food, available in many restaurants, is becoming very popular in Australia. Apart from its good taste and exotic appeal, it is light, healthy food with little or no fat or dairy products. It's fun (and much cheaper) to have a go at making your own.

Some of these delicacies, like sashimi (simply raw fish slices), require no cooking, while others such as sushi, need very little cooking, though only the freshest ingredients may be used. However, the arrangement and presentation of the food is very important — it must be beautiful to look at.

Ingredients for these Japanese dishes are becoming easier to obtain and are available at many Asian grocery stores and supermarkets. Korean dishes are similar.

SUSHI

There are many kinds of sushi — little rolls of cooked rice moistened with vinegar, wrapped in seaweed or omelette skins with a central core of tidbits, like raw fish (sashimi), egg, tofu, cucumber or vegetables. The dried seaweed for the sushi 'skins' comes in thin sheets like crisp green paper.

Sushi rice

4 cups warm cooked rice (white or brown)

4 tablespoons sugar (or 2-3 tablespoons honey)

5 tablespoons **rice vinegar** *(Mitsukan* is one brand)

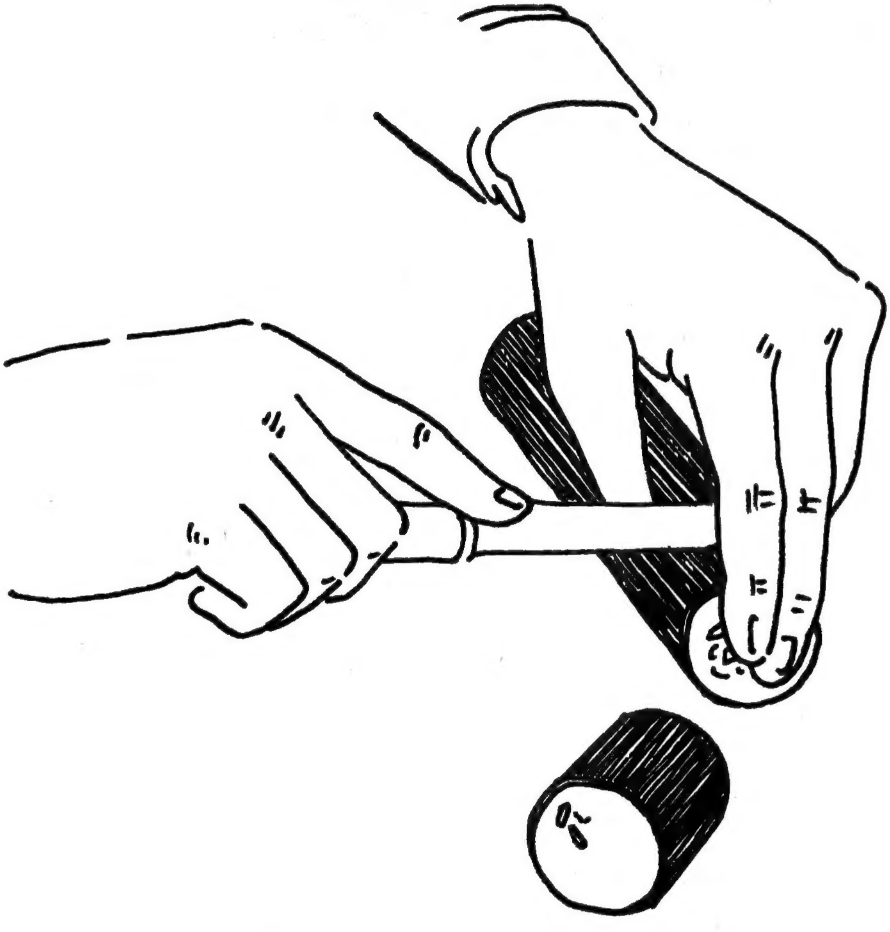
2-3 teaspoons salt

Gently heat vinegar, salt and sugar together, stirring until sugar is dissolved. Let this mixture cool, then slowly add to warm rice. Try to use non-metal utensils.

Sushi rice should not be mushy and the grains should be separate. Use the mixture the same day.

Rice and other ingredients rolled up in seaweed skins are called *Nori-maki.* The dried seaweed you need is a square shape. When you put the rice into the seaweed and roll it up, the moisture from the prepared rice and vinegar is usually enough to soften the seaweed.

Japanese cooks use special small square frying pans to get the right shape for the rolled omelette 'skins'



used to make *Kobana-maki* sushi. But if you use an ordiniary round frying pan, you can use the bits you cut off to obtain the square shape as tidbits in the sushi.

Omelette 'skins'

Makes 3 omelettes

2 eggs
1-2 teaspoons sugar
¼ teaspoon salt
oil (or butter) for frying.

Mix the eggs in a bowl, then lightly stir in salt and sugar.

Heat a small amount of butter or oil in a frying pan and pour in one-third of the egg mixture, tilting the pan so the mixture spreads thinly over the base. Cook over moderate heat until the omelette sets underneath (this doesn't take long). Turn and cook the other side. The finished omelette should be quite thin. Repeat until the three omelettes are cooked.

Tidbits

These tasty 'extras' go in the centre of each sushi roll. They may be small bits of raw fish, omelette, cucumber, prawns, pickles, raw zucchini, tofu, avocado, seaweed, cooked vegetables and so on.

Assembling the sushi

Lay down the square 'skin' of dried seaweed or omelette flat on the kitchen bench, board or a bamboo placemat. Spread sushi rice over the lower half. In the middle of the rice, put in the strips of raw fish and other tidbits.

Roll up firmly, then cut into bite-sized small rounds about 2.5 cm (1 inch) thick, using a sharp knife. If the rolls are too thick (about 4 cm) cut narrower strips. If the rolls are too thin, cut longer strips. It's easier to cut the rolls straight away, before the seaweed softens.

Arrange the sushi rolls attractively on a plate and decorate with sesame seeds or sliced vegetables. Provide tiny bowls of soy sauce or tamari for dipping the sushi.

Sushi is usually eaten with chopsticks (dip the rolls into sauce first), or you may use your fingers, which is not considered to be bad manners in Japan.

Once you start experimenting with sushi you'll find there are endless combinations and tastes.

SASHIMI

Sashimi is a dish of finely sliced slivers of raw fresh tuna served with dipping sauces, towards the start of a meal. The fish is not marinated nor treated in any way. Shredded lettuce or alfalfa sprouts make an eye-catching bed for the pink fish slices. Grated carrot, slivers of cucumber, radish and cress make decorative garnishes. Traditionally, various pickles such as sliced horseradish or tiny onions accompany sashimi.

Wasabi (green horseradish 'mustard') sauce is usually served with sashimi. Wasabi is available in powdered or paste form and is diluted with water or soy sauce to make a thick dip with quite a strong, sharp taste (guaranteed to 'change your palate').

Tuna sashimi, from The Fine Art of Japanese Cooking.

When eating, you pick up a slice of sashimi with your chopsticks (or a fork) and dip it in Wasabi, soy sauce, tamari, or ginger sauce which is made by adding finely grated ginger root to soy sauce (about 1 tablespoon of ginger to half a cup of soy sauce).

Freshly caught tuna, usually yellowfin, is now on sale at city fish markets. When the fish is more than a day old it is considered to be too stale to use as sashimi and should be cooked. In Japan, the popular types of tuna are big-eye and bluefin. We have found that fresh local jewfish or kingfish makes delicious sashimi (catch your own!). Frozen fish cannot be used for sashimi.

Finely sliced fresh raw beef prepared in the same manner is called *niku-no-sashimi.*

If you want to go more deeply into Japanese cooking, a good book with colour photos and simple explanations which is readily available is **The Fine Art of Japanese Cooking,** by Hideo Dekura (Bay Books, Sydney, 1984). We bought ours at our local newsagent for $4.95.

A kid's cook book

Naturally It's Good

. . . I cooked it myself!

Robin Toth, Betterway Publications Inc, White Hall, Virginia, USA, 1982, 175 pages. Distributed in Australia by Doubleday.

"A kids' cookbook with stuff about nutrition."

Robin Toth aims this book at 10 to 14-year-olds, an important age in awareness of good eating habits, and succeeds in pitching it 'just right'.

We gave this book to our daughter Melissa, who is now 11. She read the 60 pages of notes on nutrition and kitchen know-how with great interest and enthusiasm and soon applied it to planning meals.

The many, many recipes are graded by hand symbols.

These make selection appropriate to the ability of the junior cook.

There are plenty of useful tips scattered throughout.

An excellent book which doesn't 'talk down' to teenagers. They can use it now and forever.

☝ — means 'easy as pie'

✌ — means 'takes more time and concentration'

🤟 — means 'call a friend or parent to help if you are new to cooking'

* means to check the Food Dictionary if you are not familiar with the ingredient listed.

Naturally Good Tips

Onions that are stored in the refrigerator won't make you cry when you slice them!

Want to keep that fresh parsley (or other herb) crisp and green? Find a jar large enough to hold it and put about ½ inch water in the bottom. Now put in the herb, stems down, screw on the top, and refrigerate. Keeps fresh for about a week.

If your pasta is always getting stuck together, try adding 1 tablespoon of oil to the cooking water next time. By the way, pasta is good cooked without salt.

Best move we ever made . . .

by Rose-Marie Loro

Having read **Changing Lifestyles** by Miriam Zolin **in Earth Garden 39,** I felt I must write and tell others of another, 'positive' side to the same subject.

In 1964 my parents, with six small children aged 4, 6, 7, 8, 9 and 10, went bush to survive.

Times were tight moneywise for my parents. They were so poor that Welfare wanted to help by putting us children into a home. We kids were terrified of being separated from Mum, Dad and each other and they wouldn't hear of it, so we all went bush as a family.

Best move we ever made . . .

Dad moved us to Sunshine, on the shores of Lake Macquarie. It was a small community of close-knit folk, mostly elderly.

Our home for some time was a large old canvas tent erected at the water's edge. It was only used for sleeping shelter as it was far too cramped for much else with a family of eight! We would eat outside our tent, each of us perched with a porridge bowl in our hands on a huge tree trunk which, it seemed, had lain on the bank forever. What a sight we made!

Our evening meal was fish, caught by Dad or one of the older children. It was fresh fish from the ocean, cleaned, then cooked over an outside fire using an old cast iron frypan; or sometimes the whole fish was wrapped in leaves and buried under the hot ashes to roast.

I remember that a lot of people pitied us, but why? We had loving parents, shelter, food and clothing. What more did we really need?

The memories are clear and sharp. I recall the very first fish I caught at the age of 7, not with a reel and line, nor with a pole and bent pin, but with my bare hands. At the time I was paddling around just offshore when Joe, an elderly fisherman who had befriended our family, yelled out from his little wooden boat. He had been pulling in a fish when it got away.

Stunned by being hooked, the fish headed inshore instead of out. I could see the fish coming my way. I stood still and put my cupped hands down into the water as Joe had shown me. The silly fish swam straight into the waiting trap. Snap! I brought my hands together fast and got him. Such was my shock at catching the fish that I stumbled and fell. Like the monkey with his hand in the cookie jar, I wouldn't let go, so there I floundered until Joe fished me out. I ran flat out to show Mum my first catch. It's memories like that which make it easier to cope with city life.

Whenever I'm feeling down these days, I put my feet up, with a pile of **Earth Garden** magazines beside me (which is how I came to read Miriam Zolin's story) and dream of yesteryear.

The memories flood back of how Mum and Dad lived off the land, on the land and with the land. They instilled in us all as we grew a love and respect for our 'earth' garden. Living without want and going through hardships all those years ago has stood us all in good stead to face life's hardships today. We see what we have rather than what we don't have.

No matter where I live, I'll always have a country heart. Thanks to my Mum and Dad giving me those years in the bush when I was young, I don't spend time wishing or whingeing for wants beyond my means, but rather I work at ways to provide us with life's necessities. The early years of 'roughing it' prepared me for life ahead. Having never had the luxuries most take for granted as necessities, I don't miss them. Thus I save myself (and, no doubt, my husband) many sleepless nights like those so many people go through in their struggle to keep up with and better the Jones'.

Our only entertainment in the bush was Dad's faithful old radio and the books. How much I learnt from books; no one will ever realise the true greatness of the written and printed word. I will never know everything, so I go on absorbing and learning.

We children had little contact with other children, apart from the daily adventure of schooling (but that's a whole new story). Life was entertaining and the antics of so many bush animals had us rolling around in fits of laughter. There was Red, the giant red coloured kangaroo, Peewee, the baby possum and Trouble, the bandicoot. They helped me to begin a lifelong love of animals, both domestic and wild.

From my early years I gained the strength and conviction to be myself, to dare to be different, to be an individual. Many city dwellers still call me a 'bush bum' because of my upbringing. It's possible my nickname comes from my manner of being straightforward, which many take as being blunt. I also believe that country folk speak more openly and honestly to others. Those early years taught me the valuable lesson of weeding out worthwhile friendships from those which would be just fair weather friends.

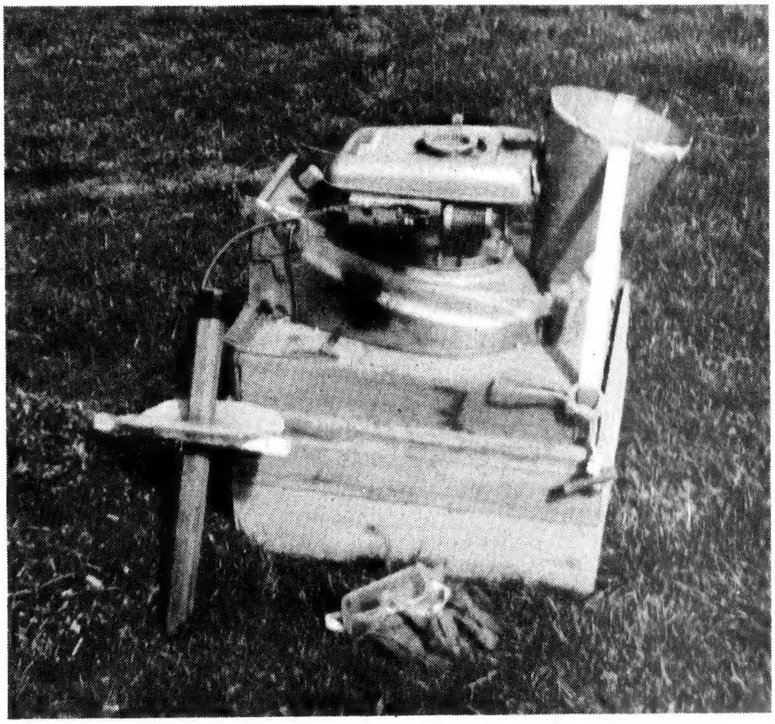
In ending my story, I would like to say this: If any parents are hesitating before their desired move to more natural living due to their concern for the wellbeing of their children — Don't panic!' Make sure there is health care (hospital/doctor) in case of need and that schooling is available, then make your move.

Rose-Marie's brothers, Tony (centre) and Victor at right with a friend on his pony.

Life on the land, with nature surrounding you, is great. It is hard work; it is very challenging; it is simplified living; it is satisifying and it is nutritionally and physically healthier (with natural unadulterated foods, pure water and much cleaner air). You will gain a feeling of satisfaction; a feeling of achievement, pride, self-worth, usefulness and self-reliance and you will be able to pass on these basic needs and feelings to your children.

Rose-Marie and John Loro told the story on how they make ends meet today in **Vegie Patch Revival** in Earth Garden 46 (page 10).

My compost muncher



By Ray Hawthorne
Franklin, Tasmania

I have been making compost in the usual manner for about two years with great success. But of course it takes time — anything from four to 12 months, depending on the temperature (summer or winter). From my reading it appeared that the smaller the surface area of the organic matter put into the compost heap, the faster the breakdown.

I was aware of the commercial compost shredders on the market, but always considered them to be too expensive. After seeing one in action and the finished compost ready in four weeks (it was summer), I was very interested.

On enquiring about a certain model which would be just right for my needs, I was shocked to find it three times more expensive than I previously thought and therefore out of the question. However, the urge to have a compost shredder was strong, so after much thought, I decided to try to make one.

Motor. When we bought this place there was an old lawn mower under the house with a couple of wheels missing, no blades and lacking several mechanical parts. But it did have compression, which was a good sign that we could get it going again. A new fuel line, spark plug and pull starter rope and, hey presto, it went and, with a few adjustments, ran perfectly.

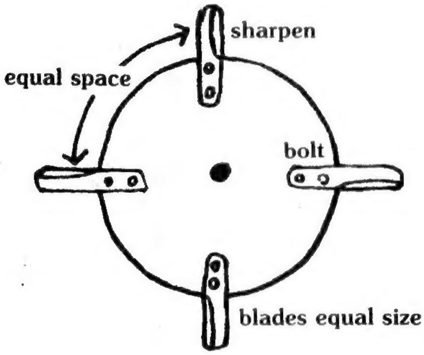


Fig 1

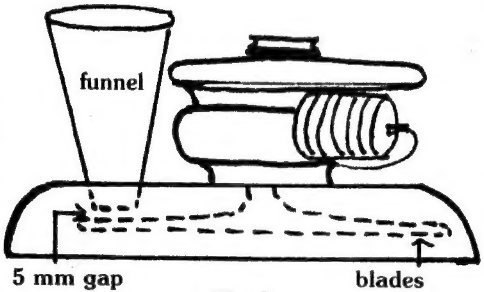


Fig 2

Blades. The next job was to make some new blades. I decided that six blades would be just about right (though four or six would probably be okay, too). The blades must be all the same size and weight and fitted equally and directly opposite one another to maintain balance in the engine (see Fig 1). They were made from mild steel, 100 mm long, 20 mm wide and 3 mm thick, sharpened on the cutting edge. I found that fixing them to the base plate rather than leaving them free to revolve works best. They can be bolted or welded, but remember that they have to be sharpened every so often.

Funnel. Next I made a 100 mm hole in the body of the mower, directly above where the blades rotate, by drilling lots of small holes then chiselling it out and dressing up with a file, Into this hole I inserted a funnel (to feed the green material), made of light sheet metal, approximately 300 mm high and 250 mm wide at the mouth (see Fig 2). Trim off the bottom end so that it sits just above the blades.

I decided to try it out, so I fixed the funnel securely with wire, started her up and fed in some weeds. Chomp, chomp — like magic the weeds disappeared. Underneath the mower, there was lovely shredded matter ready to compost.

Box. To do a lot of shredding at once I built a box (shown in the photo) as a stand on which the compost muncher could sit. The box was handy also for fastening the supports for the funnel and attaching the throttle lever.

Pusher. I made a device for pushing in the weeds to save the fingers, just long enough to miss the rotating blades and with a guard on top to stop anything flying back up. I also wear gloves and goggles for safety. If abused it could be a very dangerous machine.

The muncher will chop up any amount of weeds, vegetable stalks, bracken fern, small green twigs and so on, I never put in any tree branches though, as I feel they would be too severe on the machine, which after all is not designed for such heavy use.

The compost is piled up in an open bin and turned once a week (or more often if you like). The greater the variety of organic matter that you shred, the better the resulting compost. You'll know when it's ready!

I always read Peter Pedals' articles in **Earth Garden** with great interest. He will probably come up with a pedal-powered compost muncher which would save a lot of noise and fuel . . . but this will do me for now!

South Pacific

Vegetables on sale at Talamahu market, Nuku'alofa.

By Sandra Morton

TONGA

Tonga is one of the most likeable countries in the South Pacific.

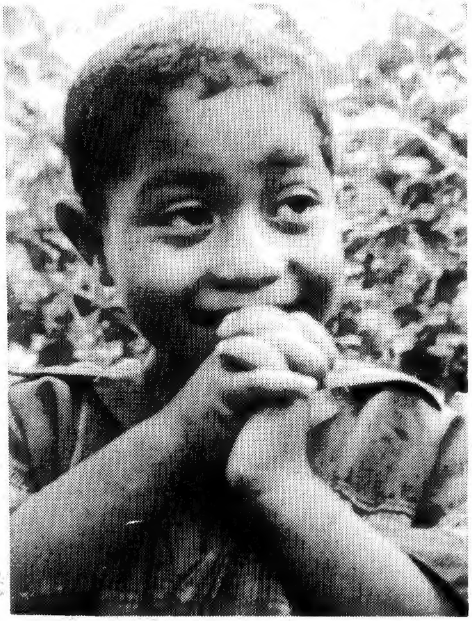
The main island, Tongatapu, is not very big. It is serviced by old Sydney buses which wait until they are full, then fill up their petrol tanks before setting off. None of the bus fares is more than 50 cents and you can see the island easily on your own.

Some walking is necessary to get to the remoter beaches, so it's worth remembering that the sun is quite intense.

Talamahu market, in the centre of the town, is crammed with piles of watermelons, coconut-leaf baskets of yams and big bunches of green bananas. The old ship chandler stores of Morris Headstrom and Burns Philp have been converted into supermarkets.

Outside the capital of Nuku'alofa, village life is placid. Houses are small, like a child's typical drawing, with two windows on either side of a door. The open louvre windows have a single knotted curtain and you can look into them as you pass during the day and see people sleeping on the floor on woven pandanus mats.

Many village houses are surrounded by neat little gardens, fenced to keep out small black pigs and wandering hens. The Tongans decorate their gardens with white clam shells and upturned brown bottles once filled with *Slake,* a sweet carbonated drink. Horses are tethered to trees. Each village has a large church and on Sundays the Tongans send long rambling hymns up to heaven. Work is prohibited by law on Sundays.



Boy at Ti'avea Upola Island, Western Samoa.

Where to stay. Accommodation is in guesthouses, some of which are along the foreshore. At **Fasi Moe Afi** (Tongan for fire and water), a single room costs about $A5.00 and there is a cafe on the premises. **Kimiko's,** run by Japanese people, costs a bit less. There is also accommodation away from the centre at the beaches, where you can get the best feel of Tonga. At **Ha'atafu Beach** resort, 21½ kilometres from Nuku'alofa, small *fales* (traditional huts) cost $4.50 a night. Tonga is cheap and as it also a bit off the tourist track there are few group tours, apart from the occasional cruise ship calling about once a month.

WESTERN SAMOA

Apia, capital of Western Samoa, is a rather unprepossessing town spread around a long curve of a waterfront with an interesting market and **Aggie Grey's Hotel,** which holds *fiafia* (Samoan feast) with local dancing every Friday and Sunday for about $11, good value.

The best way to get around the island is to hire a car. A Suzuki cost four of us $15.00 each for the day. There are buses and though some of them leave Apia early in the morning, the Samoans say it is difficult to get all around the island in a day.

There is only one hotel outside Apia, an offshoot of Aggie Grey's, or you can stay with the locals (which can be tiring). The *fales,* (traditional Samoan homes), platforms with poles around the rim and thatched conical roofs are completely open, so that you can see everything that is happening inside.

Savai'i, the other main island of Western Samoa, can be reached by plane flying by Polynesian Airlines, or by ferry across the strait. Although you can spend the 2½ hour journey listening to soft, gentle Samoan voices, you may find it too rolling to be pleasant. Buses meet the ferry at the wharf.

Savai'i is a very wooded island with Kapok trees, breadfruit trees, reddish cocoa trees and palms sprouting bird's nest ferns and elkhorns. The north-east area has lava fields from the volcanic eruption of the early 1900s.

Where to stay. Hotels here are few and more up-market, but there is a reasonably priced one at Vaisala on the north coast, near the timber mill town of Asau. Single rooms cost $13.00 and there is a shop where you can buy food. Otherwise travellers can stay with families and reimburse them with bought food, but be prepared for constant company.

What to take. Take as little as possible. A shoulder bag is good as it fits under the seat in buses, can be picked up more quickly than a rucksack and doesn't crumple your clothes as much. Unless you intend to catch boats regularly, it's not worth taking a sleeping bag. I keep a list of things to take and after a trip, write down any ideas on what will be needed next time and any mistakes I make.

Items that have proved useful over the years have been an Indonesian sarong (which can be used as a sheet, a beach mat, a wrap-around or even a curtain), a small scrubbing brush, an elastic clothes line and a New Zealand japara jacket. Last trip I took a Swedish *Trangia* stove which runs on methylated spirits and was impressed by its performance.

It's worth taking goggles and a snorkel to the South Pacific as the underwater world is fascinating and some of the reefs are national reserves.

Except for malaria tablets, I don't load myself up with medicines, preferring natural remedies. I think you can listen to your body's needs. We have a fear of sickness in the West and yet it is a part of life to be coped with.

BOOKS

The South Pacific Handbook, by David Stanley, edited by Bill Dalton, is the most useful book on the region. Although I use guidebooks a lot, sometimes it seems sad that so many are being written. It just means someone else has been there before you, recorded it all and blunted your own sense of discovery. It also means that you don't ask the locals as much as you would because it's all written down.

Across the South Pacific: Island hopping from Santiago to Sydney, by Iain Finlay and Trish Sheppard (Angus & Robertson), is interesting background reading. **Samoan Teacher,** by George Irwin, has good information about Samoa and **Ten Years in Tonga** includes a good description of Tongan village life.

And the South Pacific? Sleeping with the sound of the ocean crashing against the reef, the smell of salt on the breeze, coconut palms curving out along the seashore, baked taro, breadfruit chips, marinated fish and roast pig, corned beef and cabin bread biscuits, mosquitos, a hot sun, the smell of coconut oil and copra, leis and shell necklaces, hibiscus flowers in black hair, brown children and sparkling blue waters.

The best way to see the Pacific is to have plenty of time and just wander from island to island. However, for those with less time, the Polypass gives you 30 days of travel on Polynesian Airlines for $US799.00. Travel is between Sydney, Apia, Nadi, Nuku'alofa, Auckland, Rarotonga and Pago Pago. The pass is also valid on domestic services to Savai'i in Western Samoa.

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Samoan lady weaving at Apia market.

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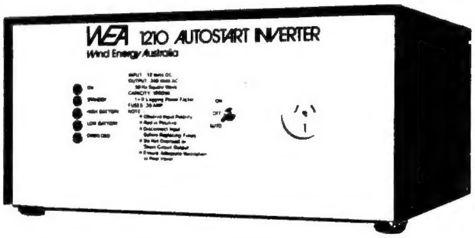

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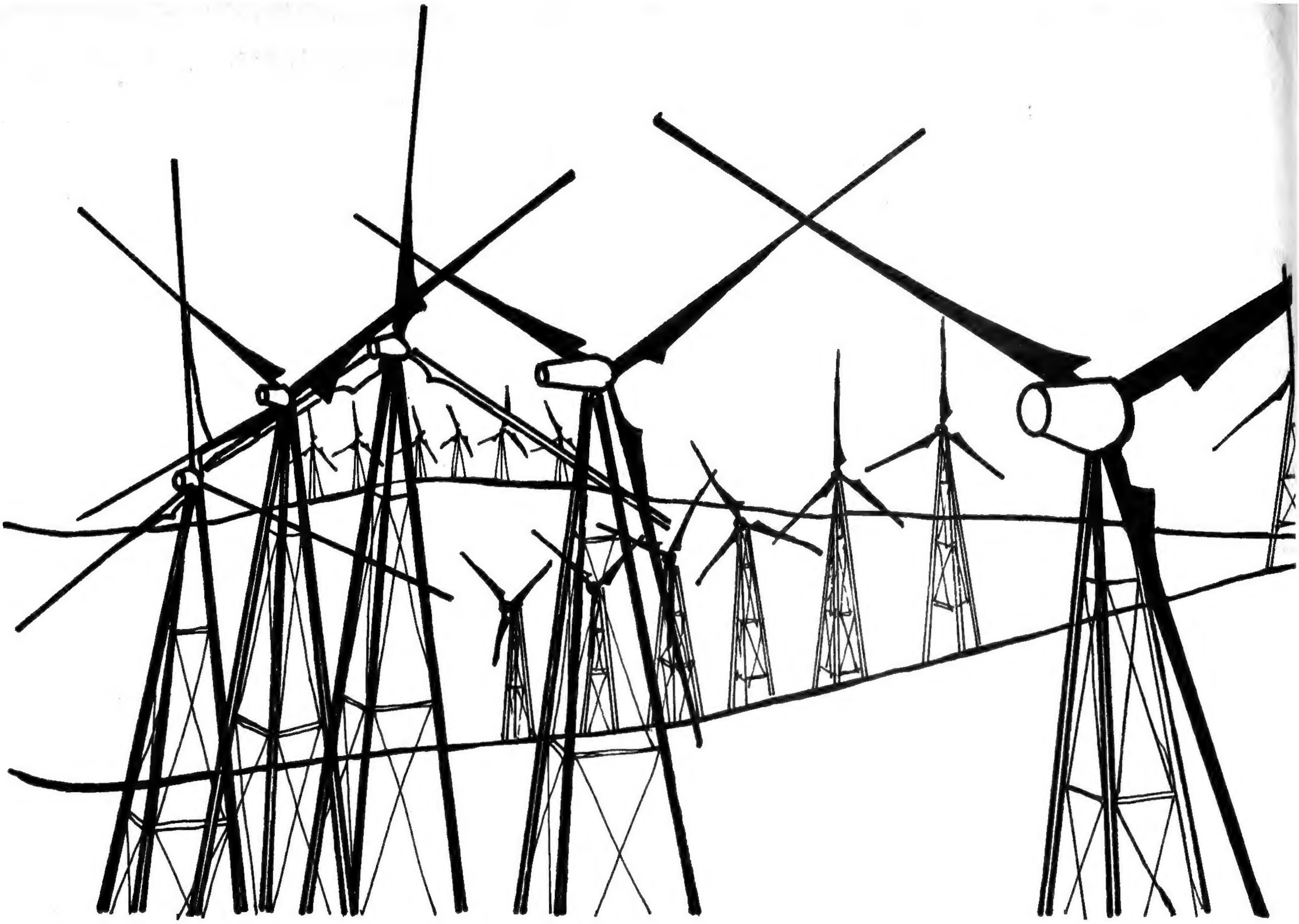

ENERGY PULSE... ENERGY PULSE... ENERGY PULSE...

A WONDERLAND OF WINDMILLS

Huge windfarms — commercial wind 'power-stations' — are changing the landscape in mountainous parts of California, where barren windswept hills have become a wonderland where hundreds of wind turbines hum and whirr as they feed electricity into the grid. These are big European wind machines, each producing 55 kilowatts (kW) and upwards . . . typical are the Dutch-made 10 kW *Polenko* WPS- 18 wind turbines.

Taking advantage of United States government subsidies and tax credits, one company, Dynergy Systems, has built a windfarm of 3,000 units on 1,200 hectares at San Gorgiono Pass, which will this year produce 150 million kilowatt hours (kWh) of electricity for sale to private utilities. One utility company, Pacific Gas and Electric Co (PG & E), bought nearly 125 million kWh of power from US windfarms in 1984.

Eroded land in the Tehachapi Mountains and the Altamont Pass, only an hour's drive from San Fracisco, has suddenly become a good investment . . . and where the land is still fertile, sheep or cattle can safely graze below the turning blades. There are good prospects for windfarms in remote parts of Australia, especially on windy coastal sites on both sides of Bass Strait and in South and Western Australia.

(Adapted from the Windworks section of *Energy Works!* — out soon.)

SOUTH WIND

Anyone interested in the uses of wind energy in Australia should read South Wind, the quarterly bulletin of the Australasian Wind Energy Association (AWEA). This little magazine covers the stormy politics of the political debate of wind generated electricity, the wind energy industry and wind generators and pumps from small to large, plus news, evaluations and events.

☐ Subscription is $12.00 per year, from AWEA, GPO Box 1965, Canberra, ACT, 2601.

RA RESURRECTED

Mobil Solar Energy Corporation of Waltham, Massachussets, is marketing a big solar module in the United States called the *Ra 180*, after the Ancient Egyptian sun god (see *The Sun Cults* in Earth Garden 6). Large square 'second generation' silicon solar cells fill a panel 1.3m x 2m (4 ft x 6 ft) which has an output of 180 watts (W).

No reply has been received from Mobil Oil Australia Ltd to Earth Garden's query (last January) asking if *Ra* solar modules will be sold here in Australia.

BIG BLOWER

The New South Wales Energy Authority is to install a 150 kW HMZ *Windmaster* generator, manufactured in Belgium, on the headland at Malabar in Sydney's eastern suburbs. The $350,000 generator is capable of creating sufficient electricity to supply 80 average homes. It has 22 metre diameter blades and will be mounted on a 22 metre tubular tower.

NSW Minister for Mineral Resources and Energy, Peter Cox, said the wind generator will operate independently of the electrical authority grid (but in conjunction with diesel and gas generators) to supplement power at the Water Board's sewage treatment works at Malabar. Tests will assess the wind generator's potential for providing power to isolated communities, lessening their dependence on diesel fuels. "The project will provide 'hands on' experience in the installation and operation of wind generators," Mr Cox said.

ITALY TO BAN PLASTIC BAGS

Italy will ban the use of plastic bags — and all other packaging materials with fibres that cannot be recycled — from January 1991. This will save Italy enormous amounts of fossil fuel energy used in plastics manufacture and cut down pollution caused by disposal and burning of plastics. Non-biodegradable plastic bags, used in most supermarkets and shops, are blamed for killing fish when dumped into seas and rivers.

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The renewable light

By Peter van der Wyk

You are probably familiar with the 5 volt lantern battery that comes with torches such as the Eveready Dolphin torch. If so, you are also no doubt familiar with the replacement cost of such batteries and their relatively short life-span. Standard price for a cheap lantern battery is about $5.

I maintain that throwaway torch batteries are among the most expensive and wasteful energy sources available. How much less wasteful of valuable resources it would be if we could use a battery that could be charged 1,000 times.

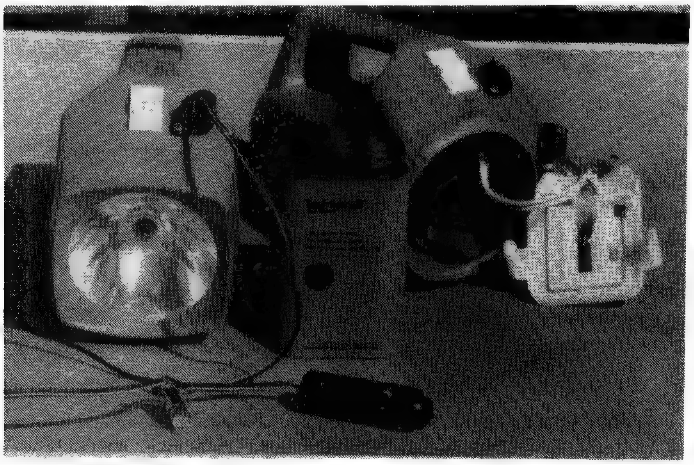
A couple of communal friends and myself have started selling rechargeable lanterns and lantern batteries. The batteries look very much the same as the throwaway version, including the two terminal springs on top of the batteries that make contact with the connectors in the torch. The major difference is internal, as these gel batteries are in fact totally sealed lead-acid batteries, similiar in performance to home lighting batteries. But instead of having sulphuric acid in a liquid medium it is in a gelatine base instead. This allows the battery to operate normally no matter how it is held, whether it be the right way up or upside down.

If you are interested in buying a rechargeable gel battery or lantern from Peter, drop him an SAE, C/- Nimbin Neighbourhood Centre, Nimbin, NSW, 2480.

These batteries may be available elsewhere, so there is nothing to stop you from making up your own rechargeable lantern. Here are the necessary details if you want to do so.

You will need a lantern, a rechargeable battery, a small 2-pin polarity conscious plug and socket, some flexible twin core wire, a small lamp-holder, a small lamp to fit the holder and four small self-tapping screws or miniature nuts and bolts. You will also need a plug to suit the socket into which your charging lead is to be plugged.

I will describe how to make up a charging lead to suit either 12 V or 24 V power supplies and also a 240 V supply.



But first I will describe wiring the socket into the lantern so that the battery does not have to be removed from the lantern in order to charge it.The plug and socket that I generally use are a 2-pin line plug (65c) and a matching 2-pin chassis socket (70c) available from Dick Smith Electronics (Catalogue Nos P-3110 and P-3115).

If you have an Eveready Dolphin lantern or a Red Alert, you will find that there is enough space just next to the switch to fit a socket. You need to make a hole large enough for the main body of the socket to fit through and then to drill two tiny holes to secure the socket by way of two small self-tapping screws or miniature nuts and bolts.

You must now decide which of the two pins is connected to the positive terminal of the battery and which is connected to the negative. The plugs and sockets that we have used on all of our converted torches have one pin larger than the other and so cannot be accidentally reversed when plugged in. With these particular plugs and sockets we have made the large pin positive and the small pin negative (with no particular reason for doing so) and this has remained our standard system.

We use about 25 cm of twin flex to connect between the socket and the contact may come in the form of flat copper or other metal rivetted to the plastic which holds the globe, lens and switch mechanism. In this case, a rivet may be drilled out and replaced by a self-tapping screw or miniature bolt behind which one of the wires may be secured.

With the Red Alert torch, one of the contacts comes in the form of a stiff steel wire clipped onto the plastic. In this case you can unclip the wire and remove it so that you can hold it over a gas flame to solder the wire on (after having twisted the wire around it). With these lantern batteries the centre spring is your negative contact and the outer spring is your positive contact.

You can now reassemble the torch with the rechargable battery in it. But just before you do, I would advise on replacing the standardlight bulb provided with either a 6 V Argon torch globe or a 6 V Krypton bicycle globe, such as used in our **Super Krypton lamps** (described in **Earth Garden 46 & 47**). The screw-in light globe works quite well in these torches even though they normally take push-in light globes.

Make sure when assembling the torch that the wire does not get in the way of the switch mechanism, nor between a battery spring terminal and the contact. Place the battery in the torch with the outside terminal down and train the wire so that it stays out of the way of the switch.

The charging lead. The principle of this charger is one that can be used in a number of applications, not only with this particular lantern. The same principle can be used to charge Nicad (Nickel cadmium) batteries wherever they occur. For instance, cordless drills with a 240 V charger are readily available. A drill like that is great to have around when you have a 12 V system, but it is a nuisance to have to find a 240 V power point every time it needs a charge.

All that is required of a low voltage charger is a resistor to limit the charging rate. If you are charging a 6 V battery from a 12 V power supply you can do so by putting a light globe of the desired wattage in the lead between the two (preferably on the positive line). The light globe then acts as both the resistor and a charge indicator.

The plugs I described earlier need to have the wires soldered into them. I find this easiest to do on a small gas burner. I poke the resin core solder into the hole as I hold the end of the pin over the tip of the gas flame. I repeat the process on both pins. After having tinned the bared ends of the wire (melted solder onto them), I then hold each pin in turn over the gas flame again, but this time poking the end of the wire into it instead of the solder.

I then cut through the positive of the two wires, leaving the other intact, and fix a lamp fitting onto the two severed ends. I prefer either of the two miniature light fittings sold by Tandy Electronics (Cat *272-353 or *27-2355). You either use the same fitting described in **Super Krypton lamps** in EG46, or you can use the miniature bayonet version.

On the other end of the charge lead you can then fit the plug of your choice (whatever suits your power supply system), remembering to make sure that the polarity is correct. The light globe that you choose to put into the fitting then dictates the charging rate of your charger.

To be on the safe side, you should choose the light globe of a voltage which is a little bit higher than the difference between the voltage of the battery being charged and the battery bank which is charging it. For instance, if your 6 V lantern is being charged by a 12 V battery bank, it is preferable to use a 12 V light globe rather then a 6 V light globe. The only reason for this is the longevity of the light globe, as it may sometimes be looking at a voltage much higher than 6 V, such as when your lantern is flat.

The wattage that you choose for your light globe depends on how fast you want to charge your lantern. If you divide watts by volts you get amps.

The gel lantern battery is a 4 amp hour battery and like any fully charged 6 V lead-acid battery its voltage should settle down to 6.3 V. I would not charge this battery more than 0.5 amp (half an amp). For a 12 V battery bank this is equivalent to a 6 W light globe, which is the largest globe available (from auto electicians) to fit the miniature bayonet fitting. The smallest globe for this fitting is 2 W (one-sixth of an amp). For the miniature screw fittings you can buy 2 amp and 1 amp light globes from Tandy Electronics.

For a 24 V battery bank you would be better off sticking to the bayonet version because there is a greater range of 24 V light globes available in bayonet than in screw fittings.

240 V charger. If you wish to make up a 240 V charging system you can use the same idea, but using a transformer and rectifier at the beginning of your lead. The easiest and safest way to do this is to buy a plug pack designed to replace batteries to power portable tape decks and radios. You must make sure that the amps it is designed for is greater than the amps of the light globe you intend to use and that the voltage it puts out is greater than the voltage of the battery that you intend to charge. All you do then is replace the fitting on the end of the lead with a plug to suit the lantern and place a light globe in the lead (as described above).

If you have a volt meter you can check to see if your lantern is fully charged while it is charging. If the voltage starts to climb over 7 V, you should take it off the charger. After being fully charged the voltage should settle back to 6.3 V. The Krypton light globes use about 0.5 amp, so if you have a half amp charger you can charge the lantern for a little longer than the amount of discharge it received. I would not advise you to ever totally discharge a gel battery. If you did it would require 10 hours at the 0.5 amp rate to charge it back up again. At 0.2 amps it would take 2½ times longer to charge and at 0.1 amps it would take five times longer.

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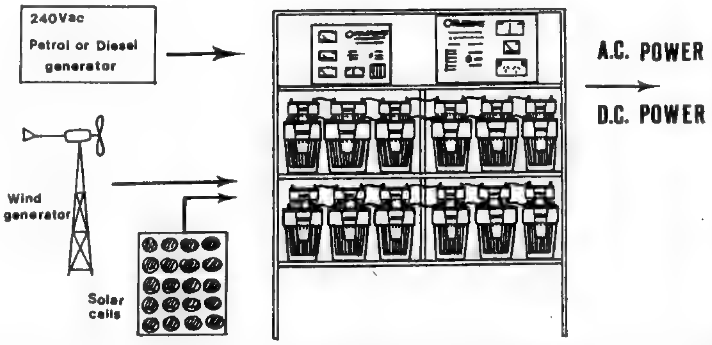

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Buying an energy system

By Steven Ingrouille of Going Solar

The most important consideration when buying an energy system is to buy quality equipment from a reputable dealer. Don't fall into the trap of buying inadequate equipment and don't forget that if something can go wrong it will, so make sure that not only the person you buy it from will give you backup service, but also that their suppliers will stand by the products they produce.

An appropriate energy system needs good design. The dealer should select the best of the various items available that go into making up the most complete and suitable system for you. The price you have to pay should be competitive, so shop around, but remember when comparing prices that you must also compare quality. In many cases you will have to rely on the word of the dealer, and the best test here is to go on recommendation. If you know of anybody in your area who has an energy system, be it electrical or hot water, they usually won't mind having a chat about it with you and they will soon tell you of any shortcomings in the equipment and whether the supplier and the backup service (if needed) has been suitable.

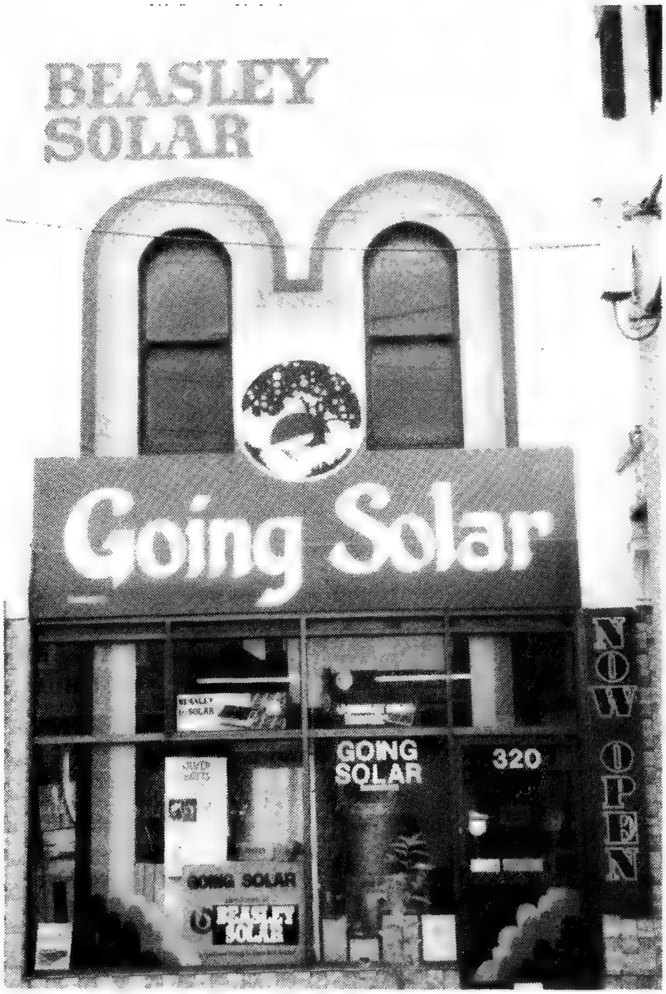
The solar industry has a great future. However, being a young industry, and like any other, it attracts fly-by-nighters and shoddy dealers. Never pay in full for goods before you get them. It is reasonable to pay a deposit (usually when you order) of about 10%, with the balance payable when you pick up the goods, or when they are delivered. Goods ordered by mail normally have to be paid for in advance, so in that case you should make doubly sure the dealer is honest.

If there is any problem with faulty equipment or excessive delays once you have placed a deposit, contact the dealer concerned first, but if there is no suitable response within a reasonable time, contact the Consumer Affairs office in your state. Be careful about equipment from interstate because if anything goes wrong it is normally the customer's responsibility to pay freight both ways. Customers considering wind generator systems should think very carefully as they are usually prone to far more problems than solar electric systems.

SOLAR ELECTRIC SYSTEMS

Over the years at Going Solar I have found that most people looking for alternatives to mains electric power fall into three groups:

1. Those who want a basic solar electric system, perhaps including lights, TV, music, small power tools and/or a small water pump. Here we normally recommend a 12V system, with the most basic consisting of one self-regulating solar panel and a pair of batteries, costing around $550. A larger system would be about $1,750.
2. Those who still want a basic system, but expect a heavier use of power, Here we often set up a 32V bank of batteries and use an inverter to run normal 240 V AC household appliances — provided the batteries have sufficient capacity and the rating of the inverter is not exceeded. Such a system is usually more suitable if you already own a lot of 240 V appliances, or where the house is already wired for 240 V AC. We design each system to suit the individual client's needs, but typical systems range in price from $2,350 to $6,300.
3. Those people who should connect to mains power, because their power requirements are those of a normal suburban house: freezers, clothes dryers, electric stoves and so on.



The lower your demand for power, the lower the cost of your system. You have to find the happy balance between cost and convenience. Think how you can set up an integrated energy system: gas or kerosene for refrigerators and freezers; gas or woodheat for stoves; electricity for lights and a solar water heater for hot weather, boosted by a wood stove.

Design. The design for your home energy system is very important:

☐ Work out what appliances you require.

☐ Find out how many watts each consumes.

☐ Estimate how long you expect to run appliances each day.

☐ Take this information to your dealer. They should be able to give you a quote and recommend a system. Going

Solar can help people in Victoria. In other states, contact you nearest dealer, or a member of the Appropriate Technology Association of Australia (a list was published in **Earth Garden 47**).

Components. These are the main components of a solar electric system:

Solar modules or panels. Compare prices and outputs, but take into consideration quality of construction. We like to sell Australian-made modules.

Batteries. The number and type is determined by the size and voltage of your system. We recommend batteries with built-in hydrometers, clear cases with plenty of room under the plates. Batteries should be in a well-ventilated space but not subject to excess heat or cold. Use wooden shelving. Beware of secondhand batteries.

Inverters. An inverter changes the voltage say from 32 V DC to 240 V AC. Buy the best quality and most efficient inverter you can. In many cases it is better not to buy an inverter that is too small, but rather run DC appliances or buy a big inverter.

Battery chargers. For use when running a petrol or diesel generator in conjunction with your battery system. Don't buy a unit that is too small for your type of batteries and buy one of good quality.

Inverter/generator change over switches. For use when running a generator or inverter.

Control panel. A good panel will have meters to show battery bank voltage and input/output current. It should also include terminals and fuses for loads and inputs.

Voltage regulators. Regulation prevents overcharging and increases the life of expensive batteries. They are not needed where self-regulating solar panels are used.

Voltage droppers. Used when it is desirable to operate 12 V appliances from a 24 V or 32 V supply.

Line filters To reduce noise on certain appliances, such as record players, caused in the line from the inverter.

Wiring. It is important that you select the correct size wire for use with your system. This is determined by the load it has to carry and the length it has to run. Ideally, your solar panels should be near your batteries and then there should be short runs to your appliances.

Lights. For DC systems buy quality flourescent lights. For 240 V AC systems, we recommend the new compact flourescents.

Appliances. Always buy the most energy efficient appliances available.

SOLAR HOT WATER

There is now a range of solar hot water systems available. I still feel it is best to keep the system as simple as possible and avoid moving parts, pumps and heat exchange systems. For people without wood stoves, the close-coupled unit is probably the most efficient and easiest and cheapest to install. I would recommend a stainless steel tank, all copper panels with low iron glass and selective surface and where necessary a reliable frost protection kit. This is for a mains pressure unit.

Where a good wood stove or open fireplace can be connected to the hot water tank, I would highly recommend that you do so. In this case the tank is normally placed inside the roof (and can be either gravity feed or mains pressure water). A stove in winter should give you all your hot water and in summer a correctly sized solar system should give all your hot water. Where mains power is available an electric element can be included in the tank, although with most people this would be used rarely.

At Going Solar, we try to recommend the most suitable system for each client, and while we can help people in Victoria, people from other states should shop around.

Every new house being built today should have a solar hot water system, or at least the right water tank should be put in the correct position so that solar panels can be added when you can afford them. The savings made by using a solar hot water system will soon pay for initial extra outlay in buying the equipment. This is true in Victoria and Tasmania, and even more so in the warmer states.

WOOD HEATING

There are many manufacturers and distributors of wood stoves, so again shop around and try to get recommendations from friends.

In Victoria, Going Solar are agents for Coonara range of wood stoves (not cooking stoves). This is a large range, with two styles and two sizes available in most models of stove. Remember, it is a lot easier to heat a house by pushing hot air around than hot water.

GOING SOLAR

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You are welcome to browse through the shop and nursery. The shop is open Monday to Thursday from 9 am-5.30 pm, Friday 9 am-6 pm and Saturday 9 am-1 pm (closed Sundays and public holidays). The shop is located near the Victoria Market, between Peel and Capel Streets.

GROWING CHLORELLA

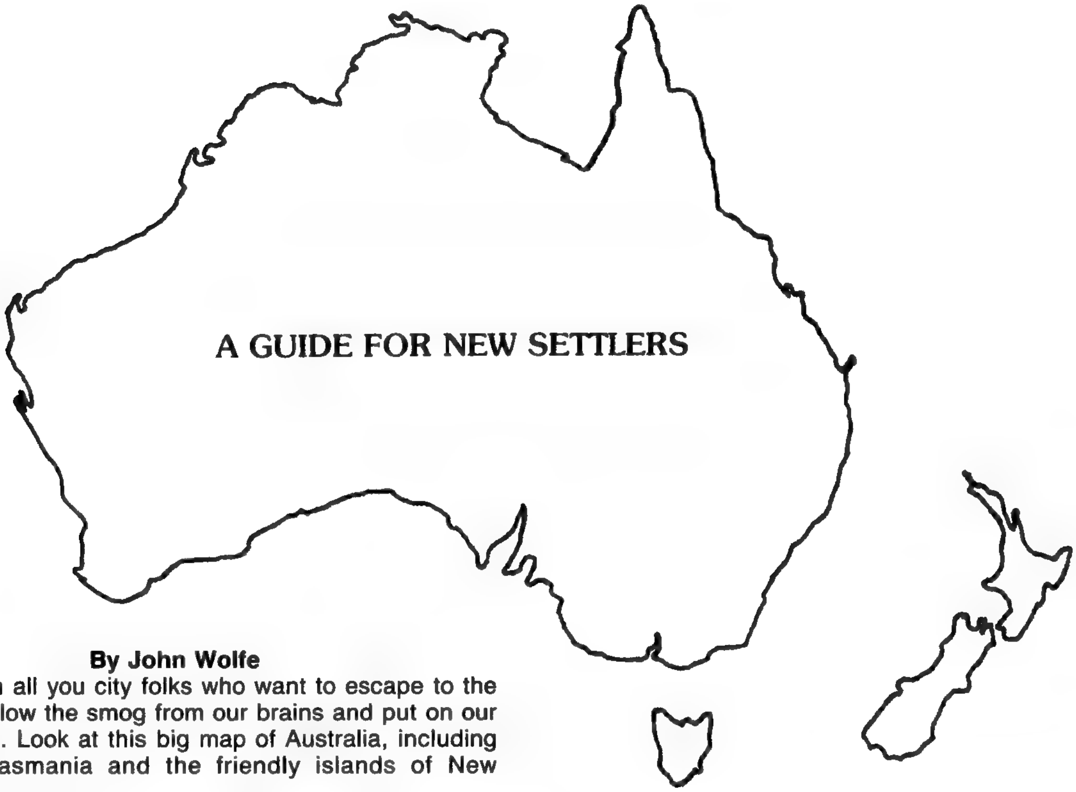
Another article on growing chlorella for stock feed by Rene Schneeberger in the Philippines will appear in our next issue, Earth Garden 49, out in February, 1986.

Rene tells us he has been inundated with letters with requests for information on algae production and even some invitations to visit Australia following his article **The algae pond** in Earth Garden 46. He hopes to answer many of your questions on algae growing and low technology farming in his second article.

"Until now I have answered more than 400 letters and there are still about 200 waiting to be answered," Rene wrote to us recently from Tacloban City. His current scheme there involves recycling 16 hectares of rice fields to produce chlorella for a piggery of 1000 head and 1,500 chickens.

"The manure of these animals we shall use to fertilise the rice fields," says Rene, "but first we shall produce biogas to run the whole farm equipment and to produce electricity. The rice bran we need for the animal feeds will be from our own rice mills and the chlorella is grown in special ponds for intensive production."

Looking for land



A GUIDE FOR NEW SETTLERS

By John Wolfe

Come on all you city folks who want to escape to the bush. Let's blow the smog from our brains and put on our thinking-caps. Look at this big map of Australia, including of course Tasmania and the friendly islands of New Zealand.

There we see evey type of climate and every sort of terrain, from Sturt's Stony Desert to the Daintree Rainforest and the hot springs of Rotorua. What more could you desire? Don't open that bottle just yet, save the celebration till later, *after* we find out what we're looking for.

Try to get your choice down to one particular climate or area. Maybe you think Darwin is too hot and humid? Right, scratch out Darwin. No, don't ruin the map, just delete the area mentally. Your mother-in-law lives in Adelaide and she's a tartar? Bad luck, there goes South Australia. Bad arthritis in winter? That rules out the Snowy Mountains. Get the idea? We've already eliminated about one million square miles.

If you suffer from hay-fever, you'd better get away from grass paddocks and head for the forest, mountains or coast. If you like fishing, seafood and a mild climate, you don't need to be Sherlock Holmes to work that one out. If you expect to grow most of your own fruit and vegetables a warm climate makes things easier.

What's that man doing? He's put on a blindfold and he's throwing darts at the map. Look at that! He hit the oil-drilling rig in Bass Strait. Please put the darts away. This is supposed to be serious.

If you need more information about a particular area, pop into the nearest travel agency and ask for free tourist brochures. The photographs will give you a general impression of the district. The local library can also help.

Now for some good news. A lot of people did all this years ago and settled in all sorts of areas. Many succeeded, some failed, and we can benefit from their experience. The new settlers have blazed many trails. Vast areas of suitable land await the influx of energetic people. Alternative lifestyle folk have the choice of battling along on their own or joining a community, with varying degrees of privacy and involvement.

Co-operatives. The co-operative land purchase, with or without subsequent sub-division, is now a well accepted method of establishing yourself on the land at low cost. If co-operatives conjure up images of "hippies" and "flower people" you've been reading the wrong magazines. The long-haired, pot-smoking hippy is an endangered species already extinct in most areas. Today, most co-operative communities consist of respectable, rather conservative young couples, raising families in their own homes. A leavening of older folk gives balance to the larger communities.

Legal arrangements vary. Generally each shareholder has a private area of land, the balance being owned by the community. The communal land may include recreational areas and reserves for forest or wildlife. Shares may be bought, sold or transferred.

Joining with others in land buying, gives big purchasing power and some magnificent properties have been acquired in this way. Examples that spring to mind are Turntable Falls valley near Nimbin in northern New South Wales and Moora Moora in Victoria. Without co-operation, these properties would have only been available to millionaires, but are now happily settled by flourishing communities.

Community activities form an important part of life on such properties. Whatever the drawbacks of a community lifestlye, the children benefit immensely and there are no more suburban housewife blues. If you want more privacy and independence, private land purchase may suit you better. You can still have the benefits of social activity by buying into a developed area, but the cost is likely to be high.

Friends. Whether you join a co-operative or go it alone, remember that loneliness was the most dreaded enemy of Australia's first settlers. The trials of life in the country are best not faced alone. Sooner or later you will need your friends, as they will need you. So wherever you go, make provision for sighting a friendly face when you need one. A lonely, isolated valley, however attractive to the lone buyer, is best settled by a group or a community.

Neighbours. The Arabic proverb to choose your neighbour before you choose your house is sound advice. Your neighbour can make or break you and you should bend over backwards to get along with him. If you can't choose your neighbour, at least try to be friends with him. Give him stuff from your garden and be patient when his dog chases your ducks. If any form of disagreement arises, don't go around brooding over it, but ask him in for a cup of tea to talk things over.

Remember that the greatest feuds have the smallest beginnings. I remember only too well a dispute which started between two large country families over an escaped pig. One thing led to another until a state of open war was reached. Gates were found left open and crops were trampled. Mysterious breakdowns of machinery occurred. Animals became sick and died. Of course, every misfortune was blamed on those b. . .s over the creek. A hot, windy day became the signal for revengeful youths to sneak up on the enemy's farm from the windward side with a box of matches and let the red heifer go. Our local fire brigade attended a number of conflagrations started by these people trying to burn out their neighbours. The feud ended in a shoot-out, with one man in prison and another in hospital.

Let's hope that your relations with your neighbours will be on a more constructive level. Meet your neighbours before you buy the property, not after. If they get a fiery look in their eyes and start to shake at words like "conservation" or "National Park", you'd better try another area. Communication is the key. Don't forget to ask your neighbour in for a cup of tea, or maybe something stronger if he's an Irishman and it's St Patrick's Day. Try to see his point of view.

Making a living. Do you expect to make a living on your own property? Maybe you plan a pottery or craft shop, selling direct to the public. If so, you will be looking at main roads and tourist areas. Or do you intend to grow produce just for your own use, achieving a degree of self-reliance, with some outside work to keep the pot boiling? In the latter case you may consider yourself as a sort of enlightened Yeoman (or Yeowoman), but with far more in the way of free time and material comforts than those sturdy folk of yore.

You may fancy an orchard or a plant nursery. Be cautious of any type of specialisation or monoculture — I mean projects like 100 acres all planted to passionfruit. Passionfruit are just great, but apart from the marketing risks and pests involved, you might get bored doing the same thing year-in-and-year-out, of milking 100 cows every night and morning. Four apple trees may be kept free from disease by natural predators and simple remedies. Four hectares of apples will require poison sprays. A thousand chooks in a shed could cause headaches, while a dozen hens on free range will give delicious eggs with orange yolks (no dyes needed). Mixed farming is a lot more interesting and far safer.

The suggestion is made, gentle reader *(only a suggestion)*, that you forget about big herds of cattle or flocks of sheep and goats. Remember you're trying to escape to a peaceful lifestyle, not searching for new headaches. Wide, rolling pastures may be your dream, but they bring all sorts of worries in the form of weed control and poison sprays, not to mention the hassles involved in animal husbandry. So just settle for good old Strawberry chewing her cud in the house paddock and giving milk and cream for the kids. Or a friendly little goat or two safely tethered in the blackberries. I never yet saw anyone raise a herd of goats and establish young fruit trees at the same time. I'm not saying it can't be done, but the odds are against you. I'll put my money on Bill and Nanny, every time.

You may wish to keep a few sheep for wool spinning, but take a mug's advice and avoid sheep farming on a large scale. Contrasted with the vigorous health of goats, sheep suffer from many diseases. They should be drenched periodically for stomach worms. Flystrike and footrot are particularly unpleasant and must be treated if the sheep are not to die a slow and painful death. Be warned, such tasks are not for the squeamish. For years I shore, crutched, drenched, dipped and chased jumbucks during daylight hours, while at night I rescued lambs and hunted rampaging dogs. Then I got wise.

Quiet and peaceful pursuits are to be preferred to chasing livestock. It is also possible to leave the property for a few days without coming back to a scene of disaster.

The following ideas may start you thinking of the 1001 ways of making a living from the land: pottery, woodcarving, furniture making, glass-blowing, garden gnomes, Christmas cards, shell necklaces, weaving, dressmaking, orchids, ferns, herbs, garden seeds, homemade cakes, pot-pourri, leatherwork.

Many crops, such as strawberries, nuts, passionfruit, lemons, avocados and kiwi fruit, may be grown profitably on a small scale for sale at local markets. If you have never kept poultry or grown vegetables, you'd better do a crash course on a farm. A number of properties offer working weekends arranged through WWOF (see *Earth Garden 46*).

And if you want a big herd of animals and open prairies, that's up to you. After all, if the sheep go bush, you can always get good old Uncle Bill to help round them up. But don't say I didn't warn you.

Finance. Let us assume by now that you have some idea of where you want to go and what you want to do. No? Keep reading then, don't throw the magazine at the dog yet, ideas sometime take time to crystallise. If you have some hard-earned cash stashed away somewhere so much the better. In these capitalistic times, few people give their land away for nothing. A few thousand dollars for a deposit may be considered essential.

If you are paying rent at present, have a little talk with your bank manager, like one of those cosy little chats you see on TV. Remember, you're the happy young person on the climb and he's the man giving away the money. *Find out how much money you could borrow for property purchase with your present rent used as interest payments.* This assumes, of course, that you would retain your present income, but it's a start and will give you some idea of loans and interest values.

If you have no capital at all, other possibilities are leasing, caretaking, or occupying Crown Land with a Miner's

Right. Caretaking and leasing give valuable experience, but the fruits of your labours will go mostly to the owner. At the same time you will be able to keep your eyes open for properties in the area which come on the market. Remember that good land seldom comes up for sale. Be clear on what you want, have a deposit ready and when the opportunity arises, act without delay.

You may see opportunities in a piece of land that other people have failed to recognise. I remember a German family that purchased an area of swamp for a song, to the amusement of locals. Loud was the laughter in the local pub at the story of the sale of this "useless" land, a realm of mosquitoes, swordgrass and black snakes. The laughter went on as the new settlers, who spoke not a word of English and were complete with huge Prussian moustaches, started digging holes in the swap and mixing concrete by hand. Luckily for them, building inspectors were unknown in the land of mud, stinging insects and impenetrable ti-tree scrub.

Then, miracle of miracles, a small waterwheel appeared in a hand-dug channel, generating electricity for the Germans' new concrete home. Within a few years the property was a flourishing fish farm.

Another sturdy migrant family purchased cheap land in a despised area of poor sandy soil and stunted scrub. These foothills had been described as useless by local farmers for generations. A programme of composting and the building of a large storage dam soon produced a vigorous garden and orchard. Other settlers soon flocked to the area and (unfortunately) land prices sky-rocketed. Blocks of land that had been offered at give-away prices for years and could not be sold were snapped up by speculators who carried out sub-divisions. Over a period of 20 years land prices increased by more than 300 times.

If you decide to go squatting, well, the best of luck, but for Australia, you were born about 150 years too late. The days of the tough, ruthless squatter are over, though if you go to an isolated area and live quietly, the chances are you will get away with it. Acceptance by a local community is slow, but eventually gives security. For legal tenure, make sure you settle on Crown Land and take our a Miner's right. Laws on Crown Land vary and it's up to you to study the land laws in your State. One thing is sure. Whatever State you are in, the bureaucrats may try to stop you. Many people outback only got their land after a long struggle with the authorities. There are few votes in the backblocks.

Transport. You will need some form of transport to get around the countryside and find out what is going on. An old van or utility is just great because you can pack in your camping gear and be independent. Good tyres are essential, as you can expect some rough roads. If the vehicle is a bit battered-looking, so much the better, you won't be worried about scratches on scrubby tracks.

Make sure you give the old crate a good going over with the grease gun and change the oil. Cast a critical eye on the fan-belt. Will it stand the strain? If it looks like disintegrating spaghetti, fit a new one. Take firm hold of one of the front wheels, a hand on each side, and rock it around. If there's clanking or movement, get it checked.

If you don't drive, a pushbike is okay, or maybe you can talk that old nuisance Uncle Bill into driving you around? If you can't ride a bike and you don't have an Uncle Bill, count your blessings. There's always good old public transport, hitch-hiking and Shank's pony.

Gear. A golden rule for travellers and campers is: *Don't take too much gear.*

Here's a run-down on basic items: small tent (or sleep in the van), airbed, sleeping bag, gas stove, cookpot, food and water. Work from there. If you don't expect pouring rain or total fire ban days, maybe you can leave the gas stove behind.

A good method of packing is to sort everything into three piles — first, those things you use every day, then things used sometimes, and finally things you seldom use. Take the first heap and leave the other stuff behind.

If you're not motorised, get a strong rucksack, a *light* bushwalker's tent and the featherdown sleeping bag. The usual gear found in disposal stores, bulky sleeping bags and plastic tents, is not suitable for walkers, unless you want to look like Atlas on safari. Don't forget a good map of the area under investigation and a notebook.

Right. Now your exploration equipment is stacked on the porch, you can study the road map while you're waiting for Uncle Bill to arrive. Here he is at last, mumbling about "this hare-brained scheme of yours".

Soon you're chugging along a pleasant country road in a lovely valley. You pass a little bush schoolhouse and some people who look friendly. One person even waves. You see a lovely house with an orchard and a creek, just the sort of place you are looking for. Of course, it's not for sale.

Stop the car. Come on, down the path and knock on the door. Ask Uncle Bill to wait in the car. On second thoughts there may be a dog. Better bring Uncle Bill to scare him off. Tell the people you are in the area looking for land. Ask if they know of any properties for sale. Write down any names or directions they give you. If you draw a blank, or hostile stares, what the hell. Most country people are only too willing to help. If you strike a series of unfriendly faces, be warned, and go elsewhere.

Maybe you will find a piece of unoccupied land that you like the look of, but can get no information on it from the neighbours. Make a sketch plan showing the location of roads and neighbouring properties, then pay a visit to the local Shire Office and study the parish plan. The Shire Clerk can find the name and address of the owner in the rates book. Next, you write to the owner and ask whether the land is for sale. It probably isn't. This all takes time, but *some new settlers have secured lovely properties by this method.*

Don't be afraid to pay a visit to major landholders and ask if they might have a piece of land for sale somewhere. If they like the look of you, you might score, or at least obtain some good advice. Remember, such people have usually been in the area all their lives.

If you have searched your favourite area and drawn a complete blank, as a last resort go to the local real estate agent. Study the properties advertised in the window before you go in. Look for the biggest "bargain" in the window, then ask about it. If this piece of land is "already sold" or "not available" for some reason, be cautious. Such "bait" properties are sometimes used to draw in the suckers, who are then offered something else.

If the agent is a quiet, pleasant old chap with an old-fashioned office, take him into your confidence. He can probably help you. If the agent has shark's teeth and a non-stop super-salesman voice and the office is filled with glossy brochures, get out of there fast.

Your first search in the country probably won't yield the property of your dreams. Don't be disheartened. Look on the bright side.

Think of all the lovely trips that lie ahead, travelling over the verdant countryside, with the ever-present chance that you will suddenly find your crock of gold.

land lines

PLEASE READ THIS CAREFULLY

These lines may change your life. Since 1972 many Earth Garden readers have found their piece of Australia, sold a farm or started a country community through our land lines.

Land lines are for people buying, selling, seeking or sharing houses and land. We charge a flat rate of $12 (prepaid) for each listing with a maximum of 50 words, plus full name and address (compulsory) and phone number (optional). This is not a lonely hearts column.

We accept land lines and unclassifieds in good faith, but cannot take responsibility for any claims made. Readers have the responsibility to check all deals.

We are a group striving for spiritual awareness and for self-sufficiency. We have 70 acres on the Walsh River in north Queensland. We are 3,000 feet above sea level and grow organic fruit trees and vegetables. We need practical people who want to prepare for the coming crisis. Camping facilitites. No drugs, alcohol or pets.

Walsh River Community, PO Box 237, Herberton, North Queensland, 4872. Phone (070) 96 2240.

Share in 1,081 acres valley to mountains Company Property. Secure, legal. 11 acres exclusive use of secluded, fertile valley with creek, views, rich soil, fruit trees, 50 inch rainfall. Council approved high-set home, verandahs all round. Separate craft workshop. Gravity fed water system. Utility, rider mower, more. Price $80,000. Photos available.

R. & S. Weismann, 'Many Slopes', Miriam Vale, Queensland, 4677, Phone (079) 74 5172.

Shares (sole rights) in 136 acres overlooking beautiful Nimbin Valley, northeast NSW. Undulating, mostly cleared land with stunning views to Nimbin Rocks from every house site. rich soil, plenty of water, rainforest gullies and stands of native trees. Phone, electricity available. School bus. Price $12,000 or $14,000 (with hut).

Contact Mark Taranto, C/- PO Nimbin, NSW, 2480. Phone (066) 89 1546.

For sale, 1/9th share in undulating 150 acres near Lismore, NSW; 5 acre homesite (choice), good access roads, fully fenced, permanent creek, dams, springs, swimming holes, timbered/cleared land. Rainforests, volcanic soil, quarry (good building stone). 105 acres common land, laundry, orchard, tractor. Seven families already established. Price $16,000, includes legals.

Contact: Margaret Ferguson, phone (03) 772 3714, or write to 34 Ilma Grove, Carrum, Victoria, 3197.

Shares in the Waroo multiple occupancy group are available. The property is situated between Wooli and Yamba on the north coast of NSW, about 10 km inland. Heavily timbered land with good rainfall. Village is about 4 km, a school bus runs. Good access. Shares are based on land area selected, ie one acre for $1,000, two acres for $2,000 or larger parcels accordingly.

Contact James Pope, Bostock Road, Tucabia, NSW, 2460. Phone (066) 44 8310.

We want to move to Queensland early in 1986 but cannot afford to buy our own place yet. So we would like to rent or caretake while we save money for our own. We are a responsible, practical married couple, dedicated to EG philosophies.

If you can help us, then please write to John and Elke Sutton, Possom Cottage, Soldiers Road, Roleystone, WA, 6111.

For sale: 52 acres in Granite Belt, neath Stanthorpe, Queensland. Natural bush and rock on hillsides, cleared creek flats. Permanent spring-fed dam. Weatherboard house, partially renovated, electricity, slow combustion stove. School bus to town, local Primary. Decomposed granite soil, grows vegetables, fruit trees. Suit self-sufficient lifestyle. Price $50,000 ONO.

Christine Duck, 34 Joalah Crescent, Ferny Hills, Qld, 4055. Phone (07) 351 6997.

For rent. Low rent for small cabin on 100 acres, half an hour inland from Grafton, NSW. Many extras.

Lyall Burgoyne, Buccarumbi, via Grafton, NSW, 2460. Phone (066) 49 4165.

For sale, 10 acres of slightly undulating, half cleared bushland on the foothills of Tamborine Mountain, 30 minutes drive from Brisbane on the Gold Coast. Fully fenced, sealed road, power at gate, small cottage and horse stable. Price $26,500.

Reto Bundi, Hannah's Road, West Bulga, Elands, NSW, 2429. Phone (065) 50 4552.

Mountain valley block for sale on South West Slopes of NSW, midway between Wagga and snowfields. 75 acres cleared, 25 acres treed. Permanent water from gully creek and race. Power pole in block. Small Herford herd. Large shed. Bitumen road frontage. Two dams. Herb planting. High rainfall area.

J. R. Griffin, PO Box 848, Leeton, NSW, 2750.

COPY DEADLINES

Copy deadline for Earth Garden display ads, unclassifieds and land lines is January 10, 1986, for Earth Garden 49 and April 10, 1986, for Earth Garden 50.

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unclassifieds

EG unclassified advertisements are for goods and services, publications, livestock and other topics which fit into the Earth Garden philosophy. Flat rate charge is $12 for a maximum of 50 words.

DONKEYS. Roaring Lion Donkeys are quiet, obedient, trained and pretty too.

For information contact Armin Ptak, Roaring Lion Donkey Stud, Undalya, via PO Box 102, Auburn, SA 5451. Phone (088) 49 2149.

BOOKS on alternative technology, self-sufficiency, the garden, food, health, self-help, arts & crafts, travel, gay & womens' issues, non-sexist childrens' books and much more.

Send $2 for 50 page catalogue, or 50c each for subject lists to Second Back Row Press, PO Box 43, Leura, NSW, 2781.

For sale, two 2 acre shares (units) in an approved multiple occupancy, Billen Cliffs, 30 km northwest of Lismore, NSW. Separate legal titles, northerly aspect, very good road access, but secluded. Water from spring and creek. Share in 40 acres commons. Schools close by. Price $14,000 each ONO.

Ring or write, Jessica Cameron, 64 Kingsley Street, Byron Bay, NSW, 2481. Phone (066) 85 7969.

Flinders Island, Bass Strait, 669 acres, choice hillside property with many building sites and spectacular views. It has the only 50 acre subdivision permit on the island under the Tasmanian Town and Country Planning Scheme. Approx 150 acres are under pasture and another 30 acres cleared. Tastefully renovated three bedroom house has large open fire, gallery and studio workshop, new kitchen, bathroom and laundry, power, ample water and telephone, also large machinery shed, shearing shed and sheep yards. Price $130,000 ONO.

For further information ring (003) 367 5955 or (052) 43 9358, or write to Marie Cocum, 5 Yan Yean Place, St Albans, Victoria, 3021.

We would like a girl or woman to come and live with our family at Cattai on our small hobby farm for about six months (possibly longer by mutual agreement). We would like her to assist with milking the cow, driving children to and from school and some household chores. In return we offer free board and lodging and some financial remuneration. Our lifestyle is simple but busy, with a new baby due early next year. Plenty of room to grow your own organic vegetables if you wish.

Please write to Merlin & Jocelyn Fiske, C/- PO Cattai, NSW, 2756.

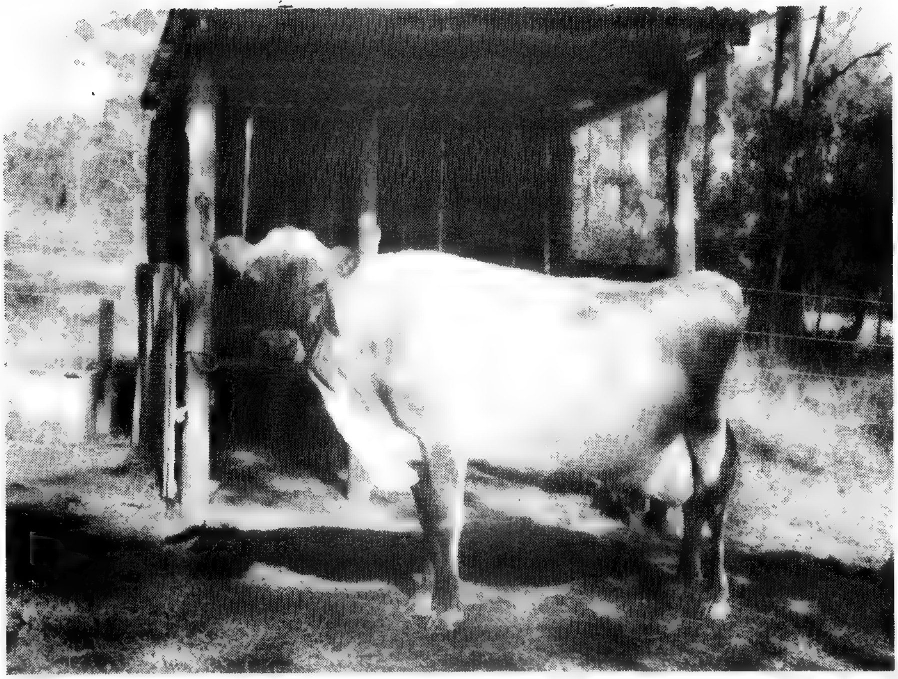
I have 2,800 acres which is in five separate titles. Title 1 is 100 acres, 2 is 500 acres, 3 is 600 acres, 4 is 1,577 acres — with two houses — and 5 is 23 acres. There is 4 km of creek, two other streams, 600 acres cleared and the rest timbered. I have run superfine sheep, goats and cattle. The country is attractive and peaceful, only 35 km to Armidale, with school bus, electricity and telephone. Must sell due to marriage breakup. Price $100 per acre, total $280,000. Suitable for group purchase.

Phone or contact M/s M. J. Scott, 'Parlour Mt', Armidale, NSW, 2350. Phone (067) 75 5203.

100 acres, half an hour inland from Grafton with a cabin and large shed enclosing laundry/bathroom. Fruit trees and vegetables planted. Land backs onto State Forest and has a dam, waterfall and rainforest gullies and is heavily timbered. Price $45,000 ONO.

L. Burgoyne, Buccarumbi, via Grafton, NSW, 2460, Phone (066) 49 4165.

Animal shelters



By Sister Helen

Calf Shed

This sort of shed may seem superfluous, but it is useful as a shelter from rain and wind for the animals, somewhere for them to feed when it's raining and a place to put the calf when it is newly born. The animals seem to appreciate it.

It is constructed of poles cut from trees on our property and half-rounds which are discarded from a local timber mill which produces railway sleepers. These are free if you collect them and are otherwise burnt periodically.

The cow bail

The mudbrick walls of the cow bail are on concrete footings and go to within about 200 mm of the roof. This allows more light and air to enter the building.

The floor is made of concrete blocks set in sand on top of a plastic sheet and grouted with cement. The floor is sloped to the front where it meets a cement drain. When the floor is sloshed down at the end of milking, the water runs straight off the floor into the drain and down into the paddock. The work entailed in this is worth it to keep the bail clean and free of flies as far as possible.

The calf shed floor is usually covered with straw or dry grass which can be removed when messy and used for compost. We tried a cement and sawdust mixture for the floor but it was not very successful as it tended to disintegrate when wet.

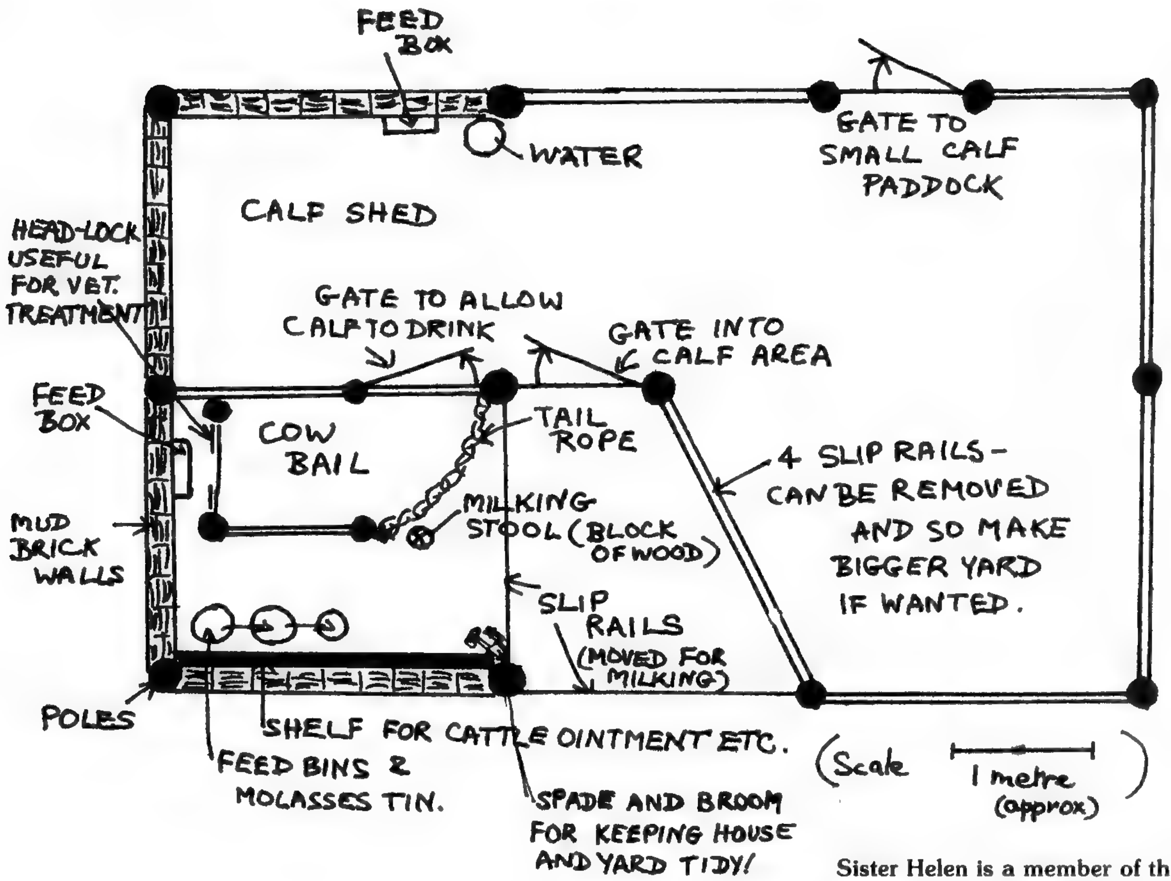
Feed boxes and the shelf are attached to the cow bail, being nailed to the cross pieces of wood. The cow's feed box is also supported by a post underneath coming up from the floor, as she is a rather vigorous eater.

The yard is post-and-rail construction about one metre high. The posts and rails used in the whole construction came from trees we felled on our property and are mostly stringybark.

We built this with some members of Kempsey CYSS to show them how to build something when you have very little money. The roofing iron was secondhand (but still good) and most of the cost was in cement and nails. It is still okay four years later.

The calf runs with the cow (a Jersey) during the day and is locked up at night so we can milk for ourselves in the morning. The calf finishes off the milking after we have taken enough.

COW BAIL, CALF SHED AND YARDS


FEED BOX
WATER
GATE TO SMALL CALF PADDOCK
CALF SHED
HEAD-LOCK USEFUL FOR VET. TREATMENT
GATE TO ALLOW CALF TO DRINK
GATE INTO CALF AREA
FEED BOX
COW BAIL
TAIL ROPE
4 SLIP RAILS - CAN BE REMOVED AND SO MAKE BIGGER YARD IF WANTED.
MUD BRICK WALLS
MILKING STOOL (BLOCK OF WOOD)
SLIP RAILS
(MOVED FOR MILKING)
POLES
SHELF FOR CATTLE OINTMENT ETC.
FEED BINS & MOLASSES TIN.
SPADE AND BROOM FOR KEEPING HOUSE AND YARD TIDY!
(Scale 1 metre (approx))

Sister Helen is a member of the Community of the Sisters of the Church, an Anglican religious order, and lives at the House of Prayer at Dondingalong, near Kempsey, NSW.

Cow bail, calf shed and yards. This setup, with its various gates, developed and was modified according to needs as they arose.

CONFEST 1985

The 1986 Down to Earth Confest will be held at the Glenlyon Reserve, near Daylesford, Victoria, over the Australia Day weekend, Friday, January 24-Monday 27.

The theme of his Confest is Co-operation. There will be workshops and discussions on many subjects including health, alternative technology and permaculture, as well as special activities for children, dancing, music, food stalls and a craft market.

No disposables are allowed, so it's BYO mug and dishes. No pets.

Early bird admission price (by December 16) for adults is $20 and $30 at the gate (concession $25) and children are free. Tickets are available by post from Down to Earth (Vic) Co-Operative Society Ltd, 285 Little Lonsdale Street, Melbourne, Victoria, 3000 and may also be bought at the Bookshop of the Environment Centre at the same address.
(Information from Jean Grieve)

access

SECOND BIOLOGICAL FARMING SEMINAR

Hawkesbury Agricultural CAE, Richmond, NSW, December 7, 1985.

The Seminar will bring together eminent people in the fields of biological farming (including organic, biodynamic and Permaculture) to explain the philosophies, benefits and drawbacks of their methods "in relation to sustaining agriculture on this fragile earth of ours."

Dr. Richard Bawden, head of the School of Agriculture at the Hawkesbury Agricultural College (and known for presenting the **Heartlands** series on ABC television), will speak on his concern about the fragility of current Western farming practice and the quest for a sustainable and equitable agriculture.

☐ Send SAE for further information:
HAWKAID, PO Box 416, Richmond, NSW, 2753.

WEEKEND WORKSHOPS

Weekend workshops on the theory and practice of mudbrick building and design with Brian Woodward and on Permaculture with Billie Fort are held regularly at Earthways Farm, Wollombi, north of Sydney, NSW. Fee for the weekend is $65.00 which covers six vegetarian meals and tea breaks.

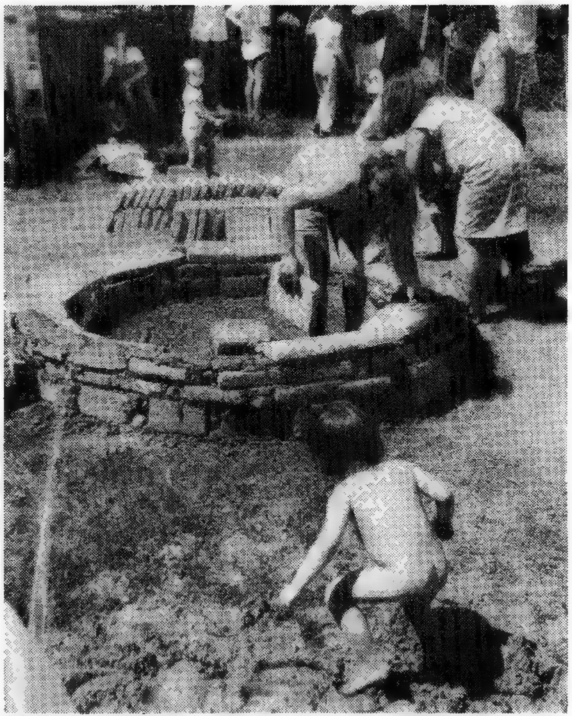
Brian Woodward, architect and author, directed the Earth Construction Research Unit at the University of NSW and is now a fulltime mudbrick builder and designer. Billie Fort is a Permaculture consultant and designer.

Send SAE for further details:
Earthways Farm, Wollombi, NSW, 2325.

CORREA CRAFTS

Central Market (Eastern end), Adelaide, South Australia.

Louise Fuller and Neil O'Brien sell quality handcrafts and gifts and natural fragrances,including soaps, pot pourri, orris root powder and essential oils at Adelaide's Central Market. Back copies of Earth Garden are also available.



Building a mudbrick dome at the 1985 Moora Moora Festival. Photo: Bob Thornhill.

MOORA MOORA FESTIVAL

Living with Alternative Technology

Moora Moora Community, 16 km from Healesville, Victoria, along the Don Road towards Mt Donna Buang.

The Mooa Moora Festival will be on, as usual, on the last Saturday in February — that is February 23, 1986. Past festivals have proved to be popular and were enjoyed by visitors as much as by ourselves. There is the warm, friendly feel of people in tune with each other, relaxing, looking at the view and the bush. Many people come yearly, mainly to check out new developments in our community.

There will be something new to see this time: our new wind electric system. A large Darrieus rotor (like an egg-beater) is to supply electricity to our Community Centre, the School and some houses. This is the main reason why the theme of the Festival is "Living with Alternative Technology". We plan to have displays, films and talks on the topic and visitors can tour the property to see alternative technology in everyday use.

An unusual feature of our Festival is that, once you have paid at the gate, you get most things free. Films talks, workshops, demonstrations, activities, tours and rides are almost all free. However, a bit of money in the pocket is desirable: good, healthy food is for sale and we allow appropriate outside groups to sell their wares for a low stall fee.

Music, dance and entertainment go on all day, culminating in a beaut bush dance, while children's activities in a separate area are also continuous (with horse rides, stories, painting, possibly a clown, kite making, demonstrations such as sheep shearing, and so on). Activities of interest will be organisd in health, crafts and buildings.

The nicest thing about the Moora Moora Festival is that it is a family day, where all sorts of people can have a lot of fun. I hope to see many Earth Garden readers there.

Love and peace, Bob Rich.

INTERESTING & UNUSUAL BOOKS

A small selection from our huge range of interesting and unusual books on Self-Sufficiency, Alternate Lifestyles, Self-Improvement, How-To-Do-It and Do-It-Yourself, Craft, Health & Fitness, Healthy Foods, Environment, Recreation, Information, Books for Writers etc. Price Lists free. FREE BOOK with all orders of $20 or more.

HD2. HANDY FARM & HOME DEVICES AND HOW TO MAKE THEM. A fabulous collection of practical instructions for the man on the land and the Do-It-Yourself type householder. A scrapbook gathered from all parts of the world but mainly Australian in orientation. Over 300 large pages just crammed with information. Illustrations must run into the thousands $10.95

F1. THE NATURAL FOOD CATALOGUE by Vicki Peterson. A very practical catalogue of information about natural, uprocessed foods with the answers to many of the questions being asked about wholefoods. All set out in A to Z glossary format treating individual foods such as grains, cider vinegar, honey, seeds and nuts and chapters on spices and herbs, beverages, gardening the organic way and kitchen utensils. A must for anyone interested in the natural food way of life. A very handsome bound production. Well illustrated $12.95

HYDROPONIC GARDENING

G14. THE MAGIC OF HYDROPONIC GARDENING by Raymond Bridwell. A basic handbook on growing food without soil. Simple instructions on how to prepare beds and nutritionally balanced solutions and how to install automatic systems which reduce work to 15-20 minutes a day harvesting etc. Extensively illustrated with diagrams, charts etc. 244 pages . . . $12.95

A NATURAL HEALTH FOOD CLASSIC

L12. BACK TO EDEN by Jethro Kloss. A classic by the founder of the modern Natural Health Food Movement, the inspiring creator of natural remedies and foods. Probably the world's best known health book, Jethro Kloss' views on herbs, health and healing were based on 40 years of experience and experimentation. Recommends herbs for over 200 health problems with descriptions and uses of 164 herbs, 76 medicinal trees and home care techniques for 112 illnesses. Also Kloss' famous recipes for healthy eating. New edition with handy index for easy reference. A massive 704 pages .... only $9.95

L23. WEEKEND FARMING - A HANDBOOK FOR ENTHUSIASTS by Robyn Hogan. A great new work offering a practical solution for city or town-based families seeking a rural life without over committing themselves. Such a venture, the author sets out to prove, can mean a healthy lifestyle, fun for the family and (most importantly) extra income. Simple but comprehensive coverage is given to 14 projects suitable for non-resident farmers including goat breeding, deer and fish, growing berries as well as the traditional pursuits of sheep and cattle raising, fruit growing and afforestation etc. A very practical down-to-earth handbook by an expert in the field. . . . $9.95

H5. ALTERNATIVE MEDICINE by Dr. James Wright. A guide to the increasing variety of medical treatments not taught in Australian Universities. A very comprehensive coverage of the field by a practitioner who has successfully combined orthodox treatments with a wide variety of alternative medicines. 280 pages crammed with interesting information $5.25

G6. YOUR FIRST BOOK OF HERB GARDENING by Elizabeth Hemphill. A delightful book designed to interest children in the pleasure of growing and using herbs. The complete young person's herb guide with recipes. Very attractively illustrated throughout in colour. A nice bound volume. $6.95

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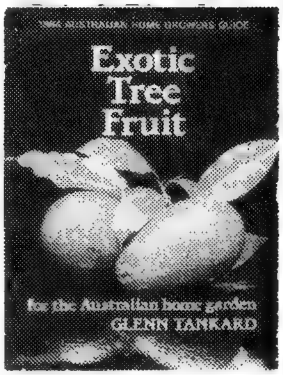
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Dear friends,

My wife and I have nine acres at Yamba, northern NSW. This block is not serviced on the grid and we will be generating our own power. What we are looking for is a bath heater, apparently it is an iron rod that has prongs (elements) that you place in a bath of cold water for about 20 minutes and, presto, you have a hot bath! My vague source informs me that it is quite safe. All information would be greatly appreciated.

Alan & Annie Richards, 12 Narla Road, Bayview, NSW, 2104.

We're just as keen as Alan & Annie to know about this device if anyone can help —Irene & Keith.

Dear readers,

Now that I am back in beautiful WA, I am looking to join (or form) a group with a view to buying a small block of land. If anyone is interested in the same venture, please write to me.

Merry Allen, 35 Clifton Crescent, Mt Lawley (Perth), WA 6050.

Dear Earth Garden,

Your little magazine inspires a lot of positive thoughts, it's the positive action that is hard!

Thanking you, Fiona Zupp, Cairns, Qld.

Dear Irene & Keith,

I read in a book called **Four Guineas** about a trip to West Africa by a lady that in one place she saw some blue chicks. Upon asking the reason they had been dyed blue, she was told that it was not so the owner could identify them, as you might expect, but that it was to stop them being taken by hawks. Are any EG readers troubled by hawks taking chicks? If so, would they care to try it? I cannot see how it would work. Surely a hawk does not mind what colour feathers its dinner is wearing!

Love to everyone, John Guest, Yeppoon, Qld.

earth people write

Dear Earth Garden,

We are in the process of putting into practice on 40 beautiful acres at Ocean View, near Strathpine, what we have learned about self-sufficiency experimenting on 24 perches for the past 20 years. We called our Strathpine housing lot Stratified Farming. As a city builds skyscrapers to make room for its occupants, our housing lot had to go up and over the house to make room to grow all our fruit and veges.

Much to the relief of our "city slicker" neighbours, we have now been able to move our accumulated farmyard to spread its wings on our sub-tropical wonderland, complete with its own waterfalls and rain forest. We are cultivating and improving 10 acres which were already planted with a comprehensive range of fruit trees and then ignored.

We have managed to save most of the trees by deep digging, removing bladey grass, chook manuring, then placing the dead grass back on top as mulch. any "wee beasties" infecting the trees are sprayed with our natural, organic pyrethum-based **Swipe-A-fly** (made by Swipe), which safely kills any insect pests. After 12-18 months of this tender care, we are starting to see the results. We have two beehives (boy, were the city neighbours glad to see those "dangerous" creatures go!), so pollination shouldn't be a problem.

Every bird in sight in our 26 ft x 30 ft Henorium is sitting on eggs, either their own or those of others we have "cuccooed" into their nests. Our part-Nubian goat is in kid to the handsomest Mohair buck she has apparently ever seen. We now have time to admire the sunsets and sit back and watch the part of our land some enthusiastic logger destroyed quickly reafforesting itself. Our motto is: "Make your work a pleasure and have seven holidays a week."

We look forward to receiving our Earth Garden copies. It is very reassuring to read about others who are getting back to basics and thoroughly enjoying the experience.

Bob & Lorraine Salthouse, Strathpine, Queensland.

Dear Keith & Irene,

Thanks for your work with **Earth Garden.** It's always interesting.

Judy and I are keen to build a small semi-underground storeroom on our bush property. It would serve as a store for vegetables and fruit, etc (in a constant temperature) while at the same time it may provide a potential refuge in case of fire. It will be built into the side of a hill.

Having no experience in building underground, we are interested in hearing from anyone who has undertaken such a venture, the difficulties encountered and materials used. Maybe Earth Garden has something on its files?

Sincerely, Judy & Stuart Reid, 41 Range Street, Camberwell, Victoria, 3124.

Dear Judy & Stuart — The article **Build a storage cellar,** by Steven Guth and Kurt Luthi in **EG19** (also in **The Essential EG**) would be a good starting point. Combine that with information on building an underground structure such as **The $50 and up Underground House Book** by Mike Oehler (reviewed in **EG42**) and you should be on your way. Good luck, Irene & Keith.

Dear Keith & Irene,

We enjoy your magazine. Keep up the good work.

There have been times in our lives when we have been forced to live what you call an alternative lifestyle. An alternative lifestyle is not easy and anyone who thinks so is a romantic. Of course, that doesn't mean that it isn't healthy and sometimes very satisfying.

We believe that if things don't change direction in the near future, in a few years time the only people who will be around will be those who can survive on their own. That is an alternative lifestyle. Please keep writing your down-to-earth magazine. It may save someone's life.

Yours faithfully, C. P. & H. Svendsen, Great Keppel Island, Qld.

Dear Irene & Keith,

Here's another of those, no, no, no to computers in any way, shape or form. They couldn't be further removed from mother nature, surely?

Am really setting pen to paper to let you know how much we have enjoyed your travel articles. I spent 39 years in England, going abroad for the first time when I was 15 in my father's yacht, crewed by three elder brothers. We sailed across the rough old North Sea to Holland and went up and down the many canals — a three-week holiday that was to give me the taste for adventure and foreign lands.

Later, when earning, I worked and saved all year for my three-week summer holiday and managed, in instalments, to see nearly every European country, the Near East and India, all California and into Mexico.

To cut a long story short, my daughter and I decided on Australia. We had never been here and didn't know a soul. Life does begin at 40! Never been happier in my life. Sold our home in Buckinghamshire (near Windsor Castle) and purchased a six acre farm in the hills outside Nambour, 10 minutes to the Sunshine Coast (with a block of land on the coast). Oh, what a swap! With views of the Glasshouse Mountains 23 miles distant. Life is terrific, growing organic fruit and vegies, breathing and feeling the presence of God's power more than anywhere else I've been.

What I'm really trying to stress is how important I feel travel in foreign lands is. Folk here are tops but are so complacent. As you know, travel does so much to broaden our outlooks, to meet with different customs and lifestyles, taste a variety of foods and have to manage the money and the languages. There is the satisfaction of having made yourself understood and surmounted the various hurdles, to say nothing of the spiritual reserves and faith that are brought to the fore when all seems to be against us. So please do keep printing travel articles so that we too may share in journeys we may never take.

Love & peace, Jenny Law, Nambour, Qld.

Brisbane Muddies

The workshop at Fred McAll's house at Laidley, showing new mudbricks at the sides while others on edge in the centre dry out. Verandahs run right round to minimise weathering from heavy Queensland rains.

Many hands make light work of moulding and turning out mudbricks. "Everyone enjoyed the day. It's just so simple, for young or old", says Chris Nash who supervised the workshop.

On Architecture in raw earth

The famous *Mud Expo* exhibition of over 120 stunning black and white and colour photos of rammed earth and mudbrick buildings in Africa, the Middle East and Australia (with a new Queensland segment), will be on display at Mt Coot-tha Botanical Gardens Auditoruim in Brisbane on January 4 & 5, 11 & 12, 1986.

The original exhibition, *Des Architectures de Terre,* was created by Jean Dethier for the Georges Pompidou Centre (Beauborg Centre) in Paris in 1981. Films, videos, publications, mudbrick samples and practical earth building equipment like the Cinva ram, will also be on show. The exhibition has already toured New South Wales, Victoria and Western Australia and will go on to other parts of Queensland in 1986 (details next issue).

The Brisbane exhibition will be coordinated by Chris Nash, an original Muddie who worked on the mudbrick monastery of St Clare at Stroud, NSW (see EG 29). Chris would like to hear from anybody who can tell him the location of mudbrick, rammed earth or early raw earth houses or buildings in Queensland as he has a grant to photograph them.

Mudbrick Workshops

Chris Nash is the focus of a new surge of interest in mudbrick in Queensland with his weekend mudbrick workshops and displays around Brisbane.

One workshop, shown in the photos, was held at Fred McAll's at Laidley. "We made 300 bricks in a few hours before inspecting three other earth built houses in the area," Chris says. "Good to see two load-bearing mudbrick houses there." About 30 people attended the day and more workshops are planned.

Copies of Chris Nash's book *The Muddies Manual,* which describes how the mudbrick monastery at Stroud was built (reviewed in *Earth Garden 40)* are available for $7 each from Chris, whose address is 363 Savages Road, Brookfield, Qld, 4069.

THE PISE PRIMER

Above: Pise walls are built by ramming or tamping earth into a wooden 'box' or formwork. Right: Bob Rich demonstrates rammed earth technique using railway sleeper formwork (see page 31) at Moora Moora Cooperative Community in Victoria.

Why rammed earth?

By Dr Robert Rich

A young man once visited Moora Moora and went on the usual "tour". He was shown a rammed earth building and looked extremely puzzled during the explanation of how it was constructed. Suddenly his face lit up and he shouted "Pies!" It was our turn to be puzzled, until it dawned on us that he meant *pise* (pronounced "pee-say" by most people, but "pee-zee" by many old-timers in the bush), which is short for *pise de terre,* which in turn is French for rammed earth.

Rammed earth is an ancient, sound and effective building method. With proper design, construction technique and maintenance, a rammed earth wall will last forever.

It is the best technique for making a wall out of sandy soil by means of compression: the crystals of sand are locked together by the application of pressure into a three-dimensional jigsaw puzzle.

A strong, rigid framework is set up so that its sides are vertical. Sandy soil of the right moisture content (just damp) is placed in the form in layers. Each layer is compressed by means of a regular pattern of thumps until the thickness is half or less the thickness of the original loose layer. The formwork can be removed immediately and set up next to the completed section or on top of it.

Rammed earth versus mudbrick

These two earth building techniques use different types of soil. The ideal **ramming soil** has a high sand content, but also incorporates a binder: clay, crushable crystals, or cement (added by the builder).

On the other hand, the ideal **mudbrick soil** has a relatively high clay content. Strength is achieved through electro-chemical forces of attraction between tiny soil particles which have been brought into close contact by means of a thorough wetting. There are soil types which are suitable for either technique. The way to tell if a soil is suitable for something is — *try it out.*

It is silly to decide on a building technique in the abstract and then to buy and transport the materials for it. It is better to adapt the technique to the soil naturally occuring on the site. Nevertheless, the most frequent question asked about rammed earth is: "How does it compare with mudbrick?" Here is a comparison.

Advantages of rammed earth. Other things being equal, rammed earth is about half as labour intensive as mudbrick. There are two reasons for this. First, rammed earth is a means of constructing the wall *in place.* Any such **monolithic** technique involves less work than the making and combining of materials. Mudbricks have to be made (mixed and shovelled into forms), handled several times during drying (stacked and turned), even perhaps stored and later removed from storage, transported to the job and laid with mortar mixed for the purpose.

Rammed earth involves preparing and transporting the soil only once. The soil may have to be sifted and cement will probably need to be mixed in, but then the soil is shovelled into forms (or poured from a bucket) and there you are, with a completed piece of wall. Second, ramming soil is used just damp, not wet and sticky. Mixing and handling wet soil is much harder work than anything you need to do when ramming.

☐ Rammed earth doesn't shrink. There are no worries with cracking, no gaps at the top or next to doors and windows. It is true that insufficiently compacted rammed earth tends to powder away. This can usually be repaired (see **Rendering earth walls** in Earth Garden 43), but is a potential problem that is best avoided.

☐ There is a limit on how many courses of bricks, stone or mudbricks a person can lay in one day. Too much and the still-soft mortar gets squeezed out. There is no such limit with rammed earth. I have seen a team of eight people complete a 4 metre long, 3 metre high wall on a single day (this wall was three sections long and five sections high).

☐ Mudbrick making and mortar mixing require a lot of water. Ramming needs only a little. This can be a big advantage if water is in short supply or has to be brought in by drums or buckets.

☐ Mudbricks take time to "cure" before they can be moved. This means that you need either a lot of flat space under cover, or you will have to spend extra time covering and uncovering the bricks as they dry. There are no such space problems with rammed earth.

Advantages of mudbricks. Mudbricks (and compressed earth blocks) can be made in advance, for example while your house plans are still being drawn up. In this way you can "put labour content in the bank". You could also employ a number of helpers by having some people make mudbricks while others are laying them. Rammed earth requires a small, practised team.

☐ Rammed earth usually requires the addition of cement (average of 5%) while ramming forms must be strong and solid. You need money for both of these. In contrast, mudbricks can be made using a mould made up of scraps and a bale of straw (if needed) will last for hundreds of bricks. **So choose mudbricks if you are strong and have lots of time, but little money.**

☐ Mudbricks can be made in rainy weather, provided there is a flat area under cover. You may be bought to a standstill while ramming if rain over-wets your stockpile of soil, though soil dug out from a steep bank as needed will usually be dry enough.

Design options. The design described in G. F. Middleton's book, **Build Your House of Earth,** (Second Back Row Press) and the Experimental Building Station publications is easy to build, if unimaginative, a simple rectangle with long, straight load bearing walls and a simple roof line.

Many people, unfortunately, are put off rammed earth because they think that rammed earth buildings must look like that. They don't. Friends of mine have a rammed earth house which is designed to look like a crystal growing out of the ground. It is large, visually complex, without a right angle in the place. Another family is currently building an octagonal rammed earth house with recycled power poles used as the load bearing structure. A third group is planning a spiral staircase in which the rungs are supported by rammed earth walls.

Rammed earth is an ideal infill material between squared timber load bearing posts or masonry timbers (a technique known as "nogging"). Recycled railway sleepers or bridge timbers make an ideal load bearing structure, including door and window frames, with rammed earth infill.

As with all earth walls, you need to start with solid footings, a masonry footing wall and a damp course layer. It is a good practice to tie the wall together with horizontal reinforcement on top of each course (usually every 600mm or so). This can be a run of brickie's mesh or two runs of barbed wire nailed into the rammed earth with 50mm galvanised nails. The wire does not have to be tensioned. Its function is to spread any point forces, so that a knock will have to push the whole wall over to do any damage, instead of causing a hole at one spot.

TIMBER FRAMING

Vertical reinforcement is essential only in cyclone-prone areas. It can pass up to the middle of the wall without any inconvenience. Otherwise the top plate over a load-bearing rammed earth wall can be tied down by devices like the one shown in **Fig 1.**

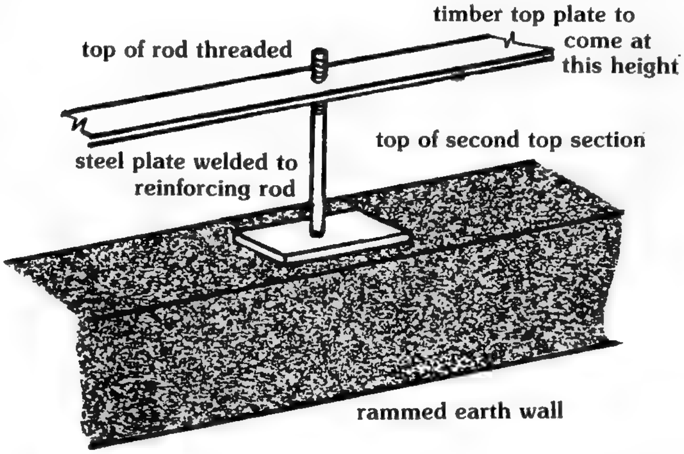

timber top plate to come at this height
top of rod threaded
top of second top section
steel plate welded to reinforcing rod
rammed earth wall

Fig 1. Device for tying down top plate on load bearing rammed earth wall.

There are a number of ways of tying door and window frames into the wall. One way is to incorporate wooden blocks at regular intervals, then later nailing the frame to these. This is not recommended because the earth wall is often cracked in the process. Even if no damage occurs, a gap between frame and wall is likely. I prefer to set up door frames before ramming and to attach them solidly to the footings.

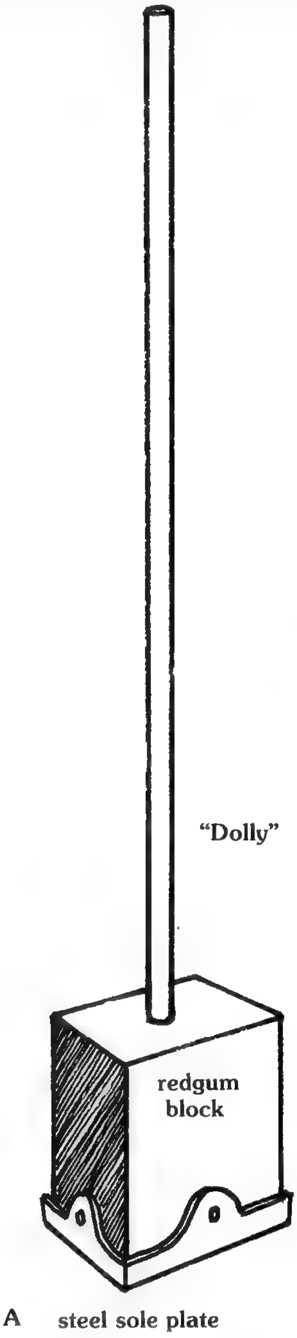
All vertical timber members (door and window jambs and load bearing posts) should have a thin batten nailed to them. A 25mm x 100mm slat of wood will tie the column into the earth wall and eliminate draughts as well. Barbed wire is nailed to the uprights. It is also a good idea to nail on bits of hoop iron — three will do for a door frame. These details are shown in **Fig 2.**

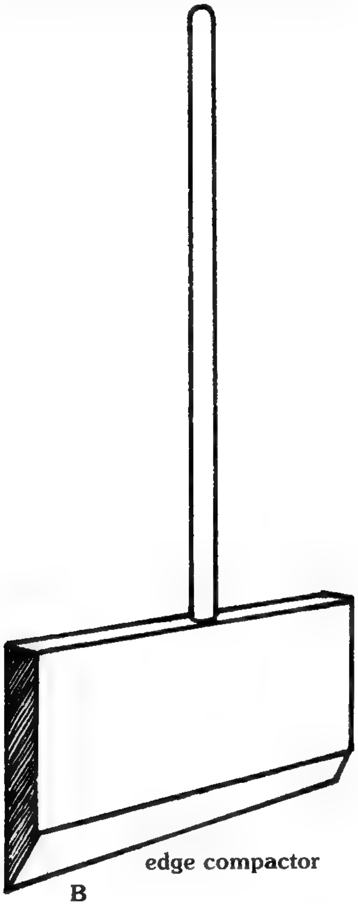
I place window frames on a bed of mortar (the ramming soil mixed with cement in a ratio like 6:1), brace them in place, then ram next to them as for door frames.

RAMMING TOOLS

A hand-operated rammer, like the one I use, used to be called a *dolly*. Mine is about 12 kg in weight. It is a piece of redgum with a 150 mm x 150 mm base. It has a steel plate screwed to the base and a handle wedged into a hole in the top. The handle is either a length of 1 inch steel water pipe or a solid "insulator pin" (a very large coach screw) from an old power pole. The two handles are the same weight, but differ in length.

Old hands used to have a second type of hand rammer as well (**Fig B**). This was a flat piece of wood with the bottom cut to a bevel and a wooden handle. It was used to do an extra good job of compressing near the edges of the form, where it is hard to reach with the dolly.





Hand rammers.

A mechanical rammer or tamper is usually an air compressor working a "back-fill tamper", a tool like a slow cycling, heavy jackhammer with a flat plate instead of a chisel.

Machine ramming is considerably faster, especially if you have a team of three or four people working together. Mixing and carting the soil and erecting and dismantling the forms are the same for both methods. The actual ramming to a given degree of compaction is about twice as fast with the machine (if you are physically fit — if you aren't fit, it is *very* much faster!) The effort of controlling the machine rammer is about the same as hand ramming. Ramming is easy work for a large air compressor, so you should recover your capital investment at the end of the job.

Nevertheless, personally I prefer the hand rammer. The time advantage is gone whenever there are mechanical faults or the wretched engine just refuses to start. With the machine you need to prepare all the soil for a section (in my case, 15, 20 litre buckets) in advance, then work like crazy while (*if!*) the machine is running. It is a tense business, with a lot of noise, hoses hissing, air everywhere, the tamper jerking the operator all over the place, heavy buckets of soil needing to be lifted under the pressure.

With hand ramming, you can mix up enough soil for one layer, ram it, then either start mixing again or go onto something else for a change. Ramming is good exercise, but it is not really heavy work once you get the knack and develop the right muscles. You can get well into a pleasant rhythm and listen to the changing sound of the wall being compacted.

It is a good idea to suit the weight of the rammer (dolly or back-fill tamper) to your strength. A lighter tool has to have a smaller base area in order to achieve the same compaction as an old "standard" dolly (25lbs, 6 in x 6 in base). If you halve the weight, you have to halve the base area too.

Regardless of what tool you use, the soil should be compressed to at least half the loose volume (for example, 100 mm of loose soil should be compressed to 50 mm or less). The wall emits a "ringing" sound when the point of maximum compression is reached and will not compress any further.

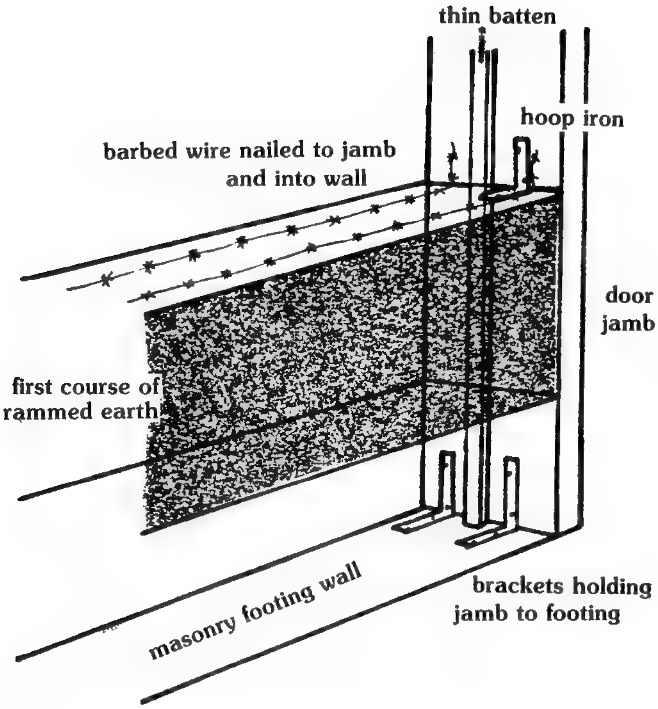

thin batten
hoop iron
barbed wire nailed to jamb and into wall
door jamb
first course of rammed earth
masonry footing wall
brackets holding jamb to footing

Fig 2. Tying door frame into rammed earth wall.

Door and window frames need to be braced internally to stop them from deforming and externally to stop them from moving. See **Fig 3**. These braces take a few minutes to erect and dismantle, but are essential. I have seen a railway sleeper used as a door jamb bent by the force of ramming.

Some people are put off rammed earth because they feel that they are not sufficiently fit and strong. This is nonsense in most cases. I have slightly built women friends who have done many hours of ramming.

One couple developed this working method to build their house. In the morning they set up the forms together. He went off to work while she rammed the section full a layer at a time, with housework in between (they lived 200 metres from the site). When he came home they repositioned the forms together, then he rammed while she mixed the soil for him. They found that building their house was like going to the gym for a workout each day, except that it was free!

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Two hawks got rid of starlings and sparrows over night", Phil Bachelor, Director of Parks and Recreation, Launceston Corporation
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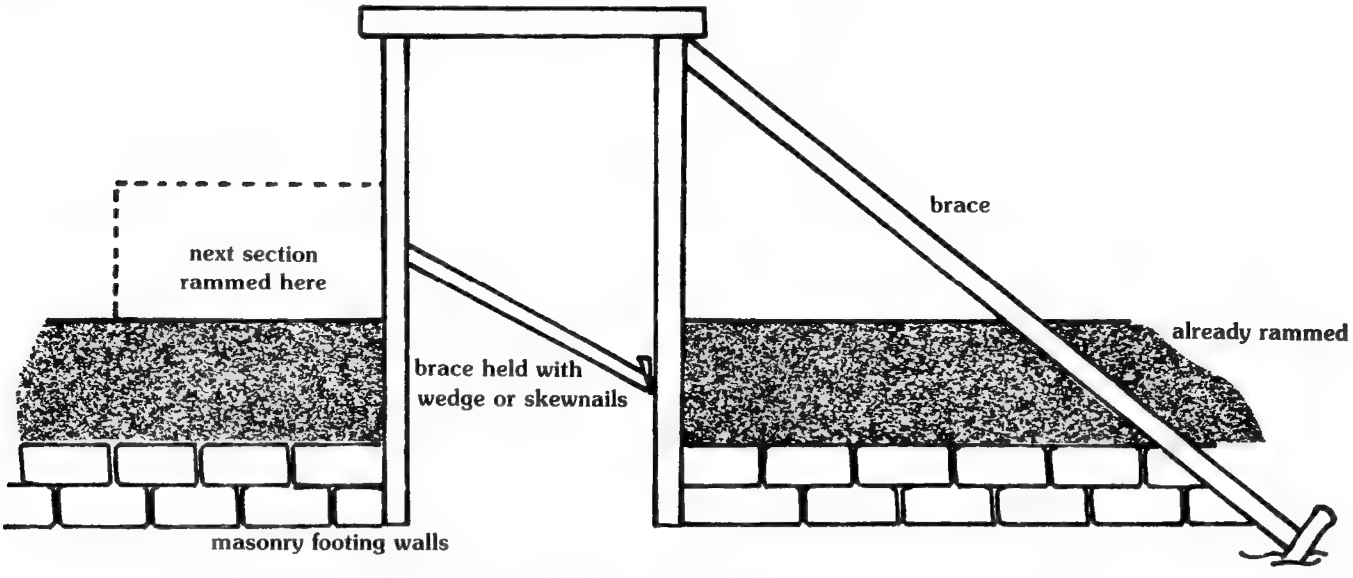
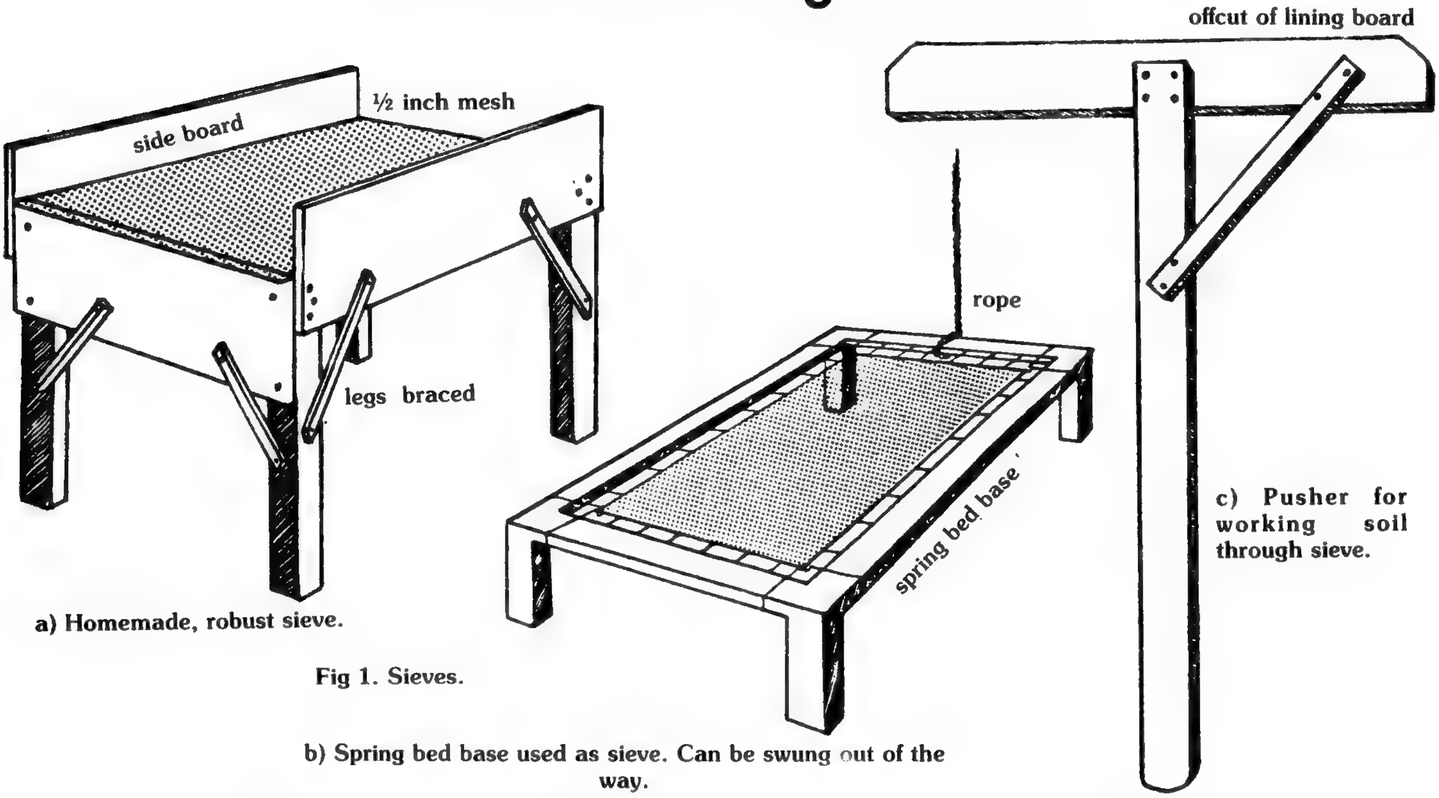


Fig 3. Bracing a door (or window) frame while ramming a wall next to it.

TECHNIQUES

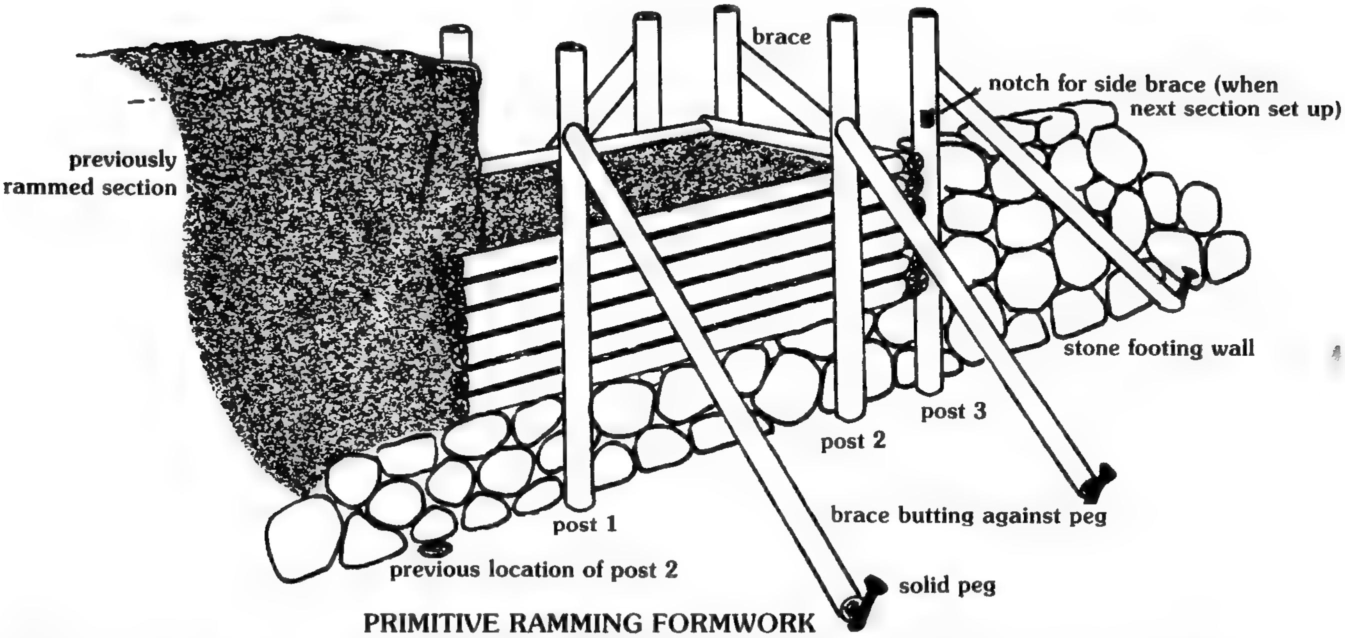
Illustrations by
Elaine Norling



a) Homemade, robust sieve.

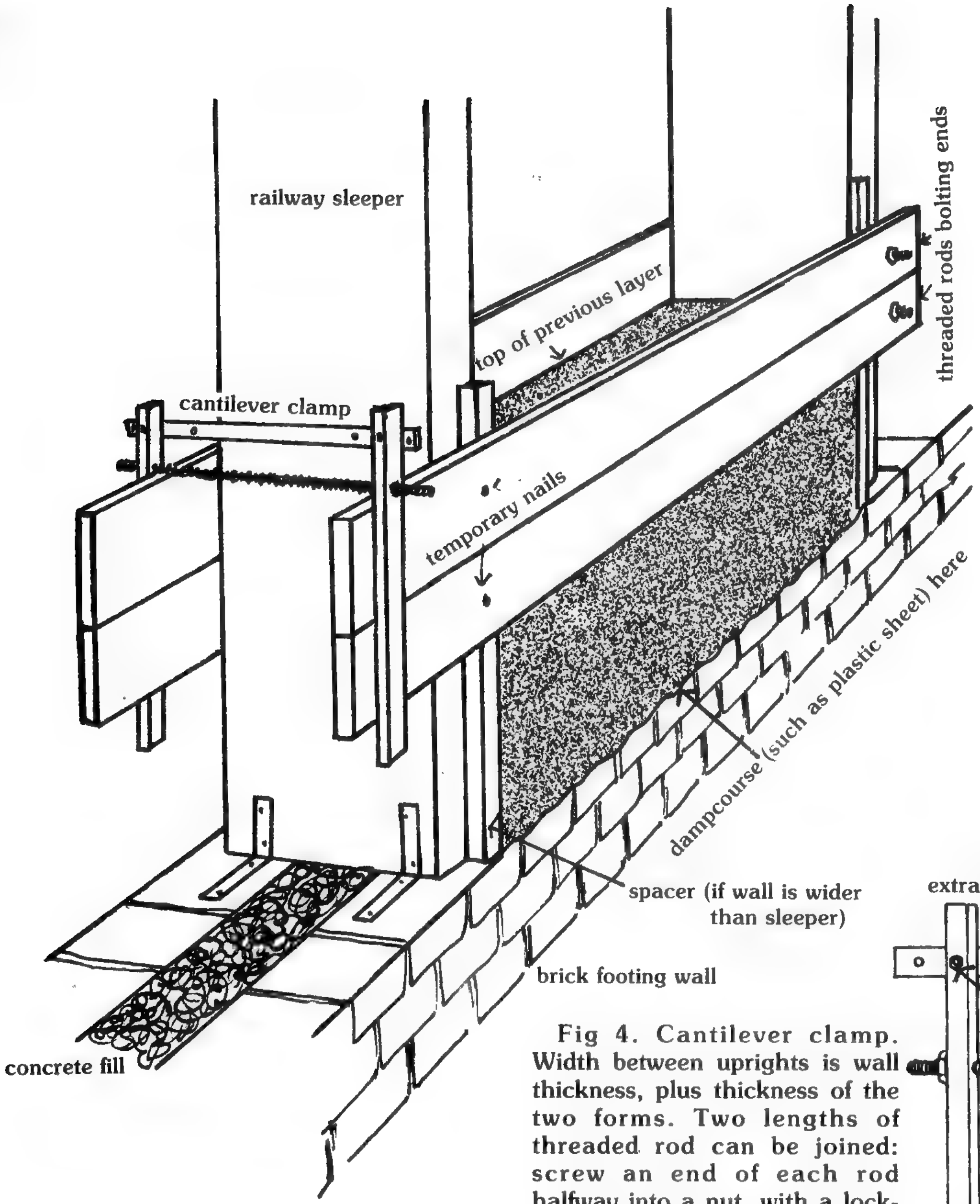
Fig 1. Sieves.

b) Spring bed base used as sieve. Can be swung out of the way.


brace
notch for side brace (when next section set up)
previously rammed section
stone footing wall
post 3
post 2
brace butting against peg
post 1
previous location of post 2
solid peg

PRIMITIVE RAMMING FORMWORK

Fig 2. In this primitive set-up, two pairs of posts (1&2) are solidly planted and braced to stop spreading. Each brace fits into a notch on the post and butts against a peg driven into the ground. One pair of posts (3) is braced behind (braces are parallel to the wall). One pair of long, straight logs is dropped onto the footing at the sides. Short logs are used as a shutter (held in place by posts 3). Soil is shovelled in and rammed to the top of the logs, then the next row of logs is added and so on, until the top of the upright posts is reached. Then posts 3 are left in place, but braced from the side (to become posts 1). Posts 1 and 2 are dug up and repositioned for the next section.


railway sleeper
top of previous layer
threaded rods bolting ends
cantilever clamp
temporary nails
dampcourse (such as plastic sheet) here
spacer (if wall is wider than sleeper)
brick footing wall
concrete fill

RAILWAY SLEEPER FORMWORK

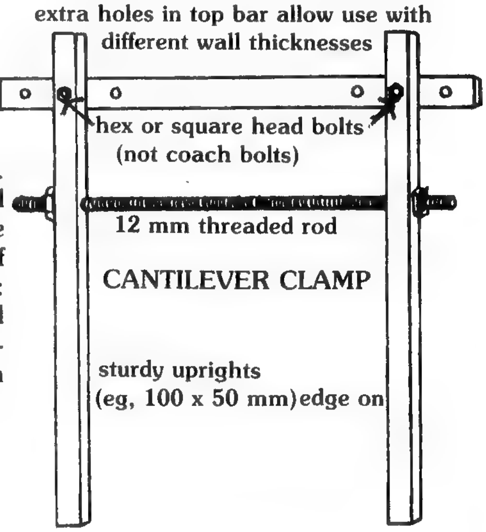
Fig 3. A ramming set-up for an infill wall between railway sleepers. The wall may be wider than the sleepers — width is made up by nailing on slats of wood. Sleepers must be plumb and immobile.

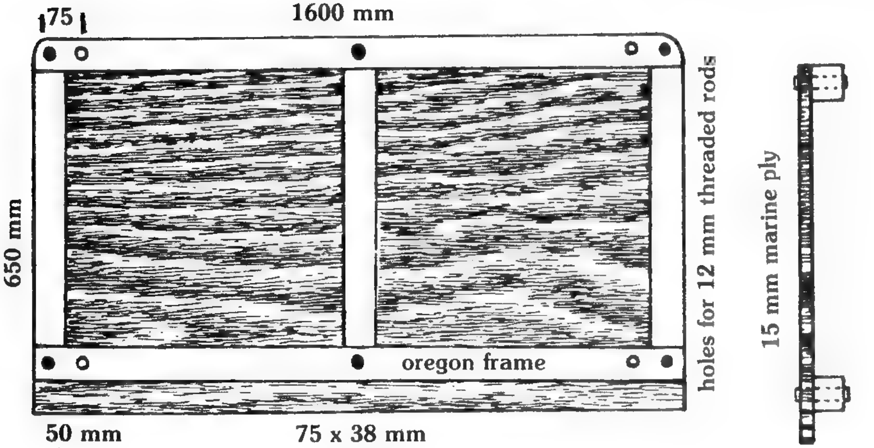
Forms can be 250 mm x 50 mm hardwood. The bottom board of the pair is moved to the top when the wall height reaches the top edge. Ends may be retained in two ways:

a) with 12 mm threaded rod if the neighbouring section has no wall yet, or

b) Cantilever clamps (see Fig. 4). The top board of the pair needs to be tacked to sleepers before the clamp is loosened. The middle of the span may need additional clamping.

Fig 4. Cantilever clamp. Width between uprights is wall thickness, plus thickness of the two forms. Two lengths of threaded rod can be joined: screw an end of each rod halfway into a nut, with a locknut on each side (three nuts in all).


extra holes in top bar allow use with different wall thicknesses
hex or square head bolts (not coach bolts)
12 mm threaded rod
CANTILEVER CLAMP
sturdy uprights (eg, 100 x 50 mm) edge on



Seen from behind

Seen from side

LIGHT PLY FORMWORK

Fig 5. This lightweight, but strong form is for rammed earth sections approx. 1500 x 600 mm. Frame is constructed with half lap joints screwed or bolted together. Ply is glued and nailed on.

Holes to take 12 mm threaded rod are placed so that end shutters lean slightly in at the top.

This form may be sheathed with light sheetmetal to increase durability.

Up go the walls

By Dr Robert Rich

So, you have decided to try your hand at building in rammed earth. How do you go about it?

Building in rammed earth is easy to understand and simple to do. You need to know about the soil, the ramming forms and the tools.

A good ramming soil is sandy, with enough clay in it to bind the crystals of sand together. A certain amount of cement is usually needed as a binder. The best proportion can be determined by small scale trial-and-error, 5% by volume being an average figure.

Sieving. It is not generally necessary to sieve the soil. Sieving is desirable if:

☐ Cement is to be added. It is quicker and easier to mix cement into the soil through a sieve than with a shovel on a flat surface.

☐ There are many stones or a lot of rubbish to be removed. The rule of thumb is to remove stones "larger than a walnut", but walnuts can be all sorts of sizes!

☐ Clay occurs as discrete lumps within a sandy base. This type of soil produces poor quality rammed earth without sieving, but excellent rammed earth even without cement if the lumps of clay are broken up and forced through the sieve.

If you are going to do a lot of sieving, it is worthwhile to construct a sieve as in **Fig 1A.** A bed base is also reasonably easy to use.

Moisture content of the soil is critical. Here is the test:

☐ Enough moisture: a handful squeezed hard will form a ball.

☐ Not too much moisture: the ball of soil will shatter into tiny pieces if dropped onto a hard surface from shoulder height.

Moisture should be fairly uniform throughout the material. Stockpiled soil should be covered up so that the sun doesn't dry it and, more important, the rain doesn't over-wet it. A dry pile thoroughly hosed the night before will be about right by the morning. Soil dug immediately before use from a steep slope or a "cave" in the hillside will almost always have the correct moisture content.

FORMWORK

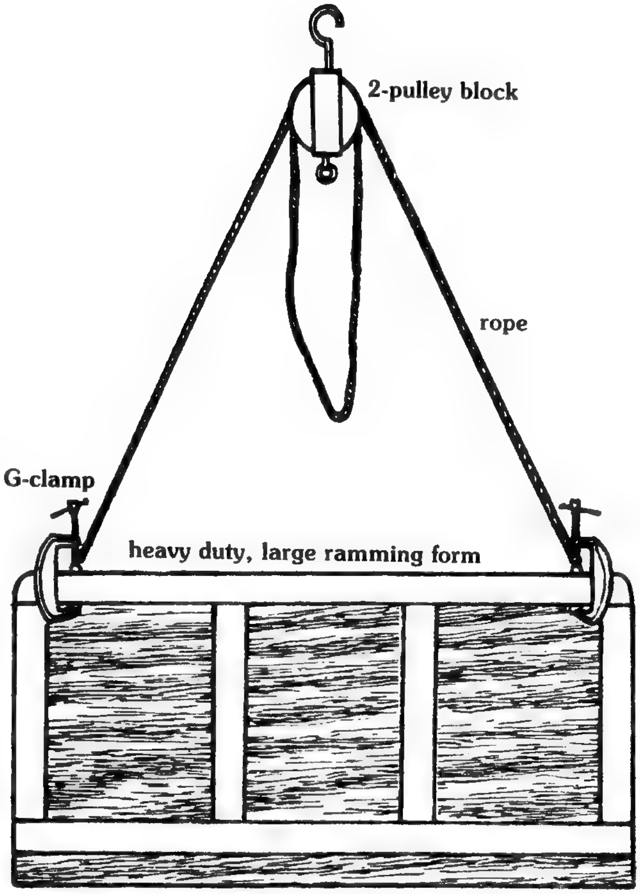
Rammed earth formwork can be made in a wide variety of ways. **Figs 2-6** show some examples.

Fig. 2 shows an ancient, primitive method. Its advantage is its very low technology. All you need are an axe, a saw, a spade and a pile of straight saplings (or bamboo poles). Each section of wall is rammed to full height because there is a fair bit of work in setting up.

Fig. 3 is a sketch of a system for ramming infill walls between recycled railway sleepers, bridge timbers, masonry columns or similar wide, square load bearing supports. Note that the columns can be narrower than the wall.

Many ramming techniques involve the use of wooden pegs which are left in the wall, or steel bolts which are removed, leaving a hole in the wall. The cantilever clamp in **Fig. 4** is a neater way of holding the forms in place. In an ideal situation the clamp brings pressure to bear on both forms, top and bottom. In practice, wall thickness can vary. This means that a gap will remain between the clamp and some part of the form. The solution is to insert a suitable wedge in this gap so that all parts of the formwork are evenly clamped.

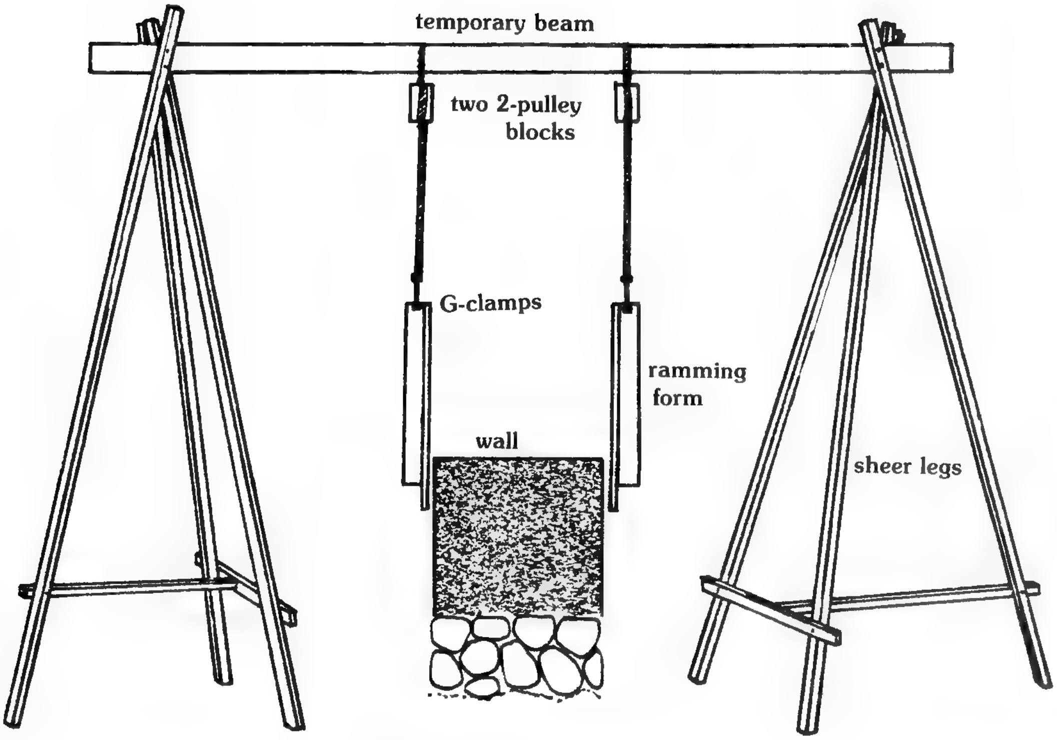
The high technology form is shown in **Fig. 5.** Marine ply glued to a kiln-dried oregon framework provides a strong, but light form.



I prefer to ram a large volume of wall at a time and to use extra strong forms which will last a long time without bowing in the middle. This is why I devised the system of raising and lowering forms shown in **Fig. 6.** I can set heavy forms into place by myself and get them plumb by fine adjustments of the four ropes.

Tricks of the trade. These suggestions should lead to a better rammed earth job, with less work.

1. It will help if you take a look at the illustration which appeared in **Earth Garden 43** (page 36), It shows that there are four ways in which shoddy workmanship can lead to soft spots in a wall.
   - ☐ The forms can spread if they are not clamped sufficiently tightly.
   - ☐ Weaknesses result if the wall is not absolutely straight, even and vertical. Such weaknesses can be patched up at rendering time, but they are much better avoided.
2. An end shutter is needed whenever a section is not enclosed by fixed members (such as posts or door frames). Where possible, the end shutter should be slightly angled, say 25mm further in at the top than at the bottom. The forms in **Fig. 5** allow for this by the placement of the bolt holes. If the end shutter is vertical you can create a weakness by lining up sections on top of one another.
3. Ramming generates surprisingly large forces. Solidly brace everything which might be bent or moved out of position.

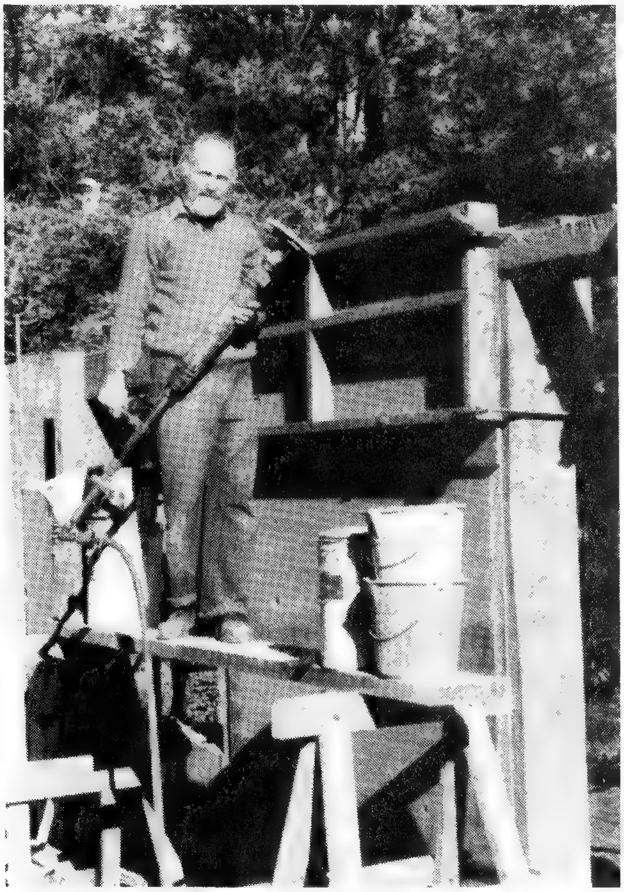


SHIFTING FORMWORK

Fig 6. Easy way of exactly positioning heavyweight ramming formwork. May be used by one person.

4. Before starting to ram:
   - ☐ Creasote all permanent timbers to be enclosed by the wall.
   - ☐ Sump oil wooden formwork sections.
   - ☐ Wet the previous section's surfaces which will be covered, and the formwork.
5. You can ram a very thin layer of soil — it will keep breaking up. On the other hand, if the layer of soil is too thick, the bottom will be impossible to compress, however hard you hit the top. Depending on strength, 50-100mm of loose soil should be used.
6. Start by lightly compacting a layer. Walking on it once all over is a good trick. Go over the whole area several (three or four) times in a regular pattern, hitting harder each time. The wall will ''ring'' when the soil is compressed to the maximum.
7. Don't be greedy. The very top layer in a form tends to be poorly compressed because the soil can be forced over the edge.

Almost anybody can ram a wall. It is a good sport and an effective way of constructing a house.



MUSCLES OR MACHINES?

Set up for earth ramming using an air compressor and a backfill tamper, showing neat finish of completed wall. "Ramming is easy work for a large compressor, so you should recover your capital investment at the end of the job", says Bob Rich.

Rammed earth renaissance

Photos by Stephen G. Dobson

The structures are varied in size, design and in the ways they are used. They include a large community centre, a country church, two wineries, townhouses, scores of Australian Colonial sytle homes with tin roofs and wide verandahs, country houses and many homes utilising passive solar principles.

Dotted throughout Australia's west, from Denmark in Western Australia to Darwin in Northern Territory, each of these 150 buildings has walls of **solid earth.** They were all built by Ramtec Pty Ltd of Cottesloe, Perth, using the centuries old method of rammed earth combined with modern machines, tools and techniques.

The walls are heavily compacted earth stabilised with cement and 300 mm (12 inches) thick, with a texture that compares with natural stone and colours as mellow as the brown, yellow, red or gold earth used to make them.

We first heard of Stephen Dobson early in 1977 when our friend, journalist Allan Croft, wrote an article, **Pise in Darwin** in Earth Garden 17, which described the first rammed earth house which complied with the strict Darwin Area Building Code (a cyclone-resistant house), built by Stephen and his brother John. Stephen, who is an engineer, moved to Western Australia and formed Ramtec in 1979.

Major buildings for which Stephen Dobson or Ramtec have constructed rammed walls include a 30 unit motel at Mataranka, Northern Territory, the Roman Catholic St Thomas Moore Cathedral at Margaret River, Western Australia, the Cape Mentelle Winery at Margaret River, the Pierro Winery at Willyabrup, 200 km south of Perth, the Community Leisure Centre at Port Lincoln, South Australia and a two-storey house which won two Housing Association of WA Home of the Year Awards (for innovation and design) in 1982.

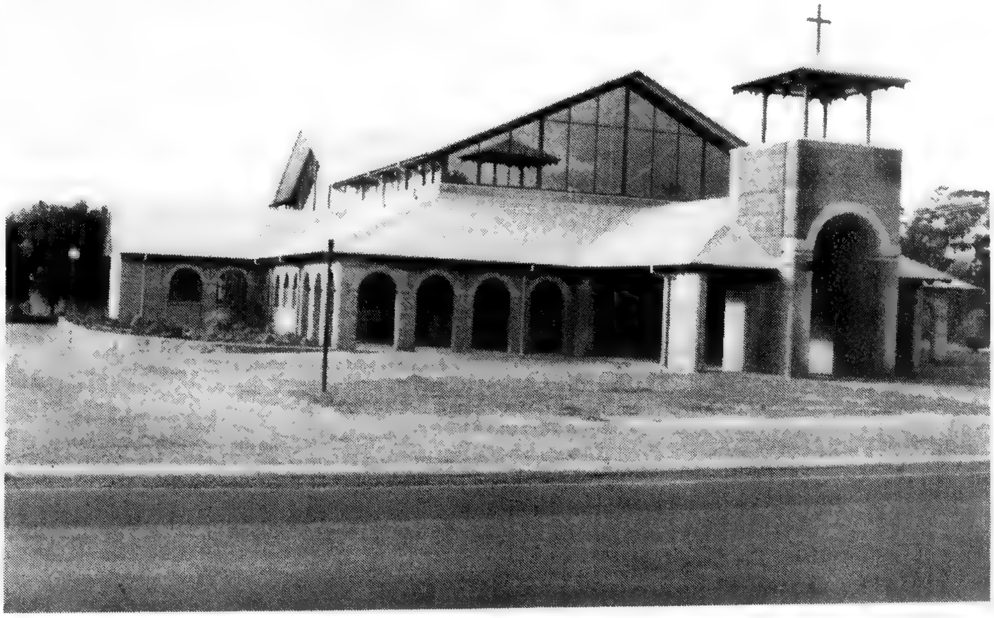
Ramtec is expanding to the eastern states and already has projects underway in Victoria and Queensland. The Company builds rammed earth walls for owner builders (or builders) as well as complete homes and buildings for the city or the country and also designs homes and draws up plans for clients. Walls for an average house take 7-10 days to complete on site.

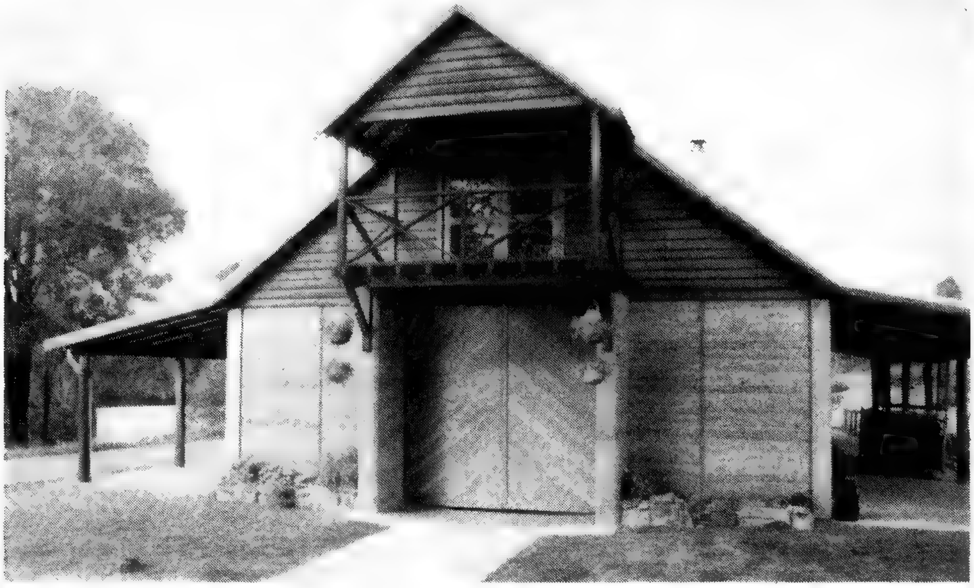
For further information, write or call:

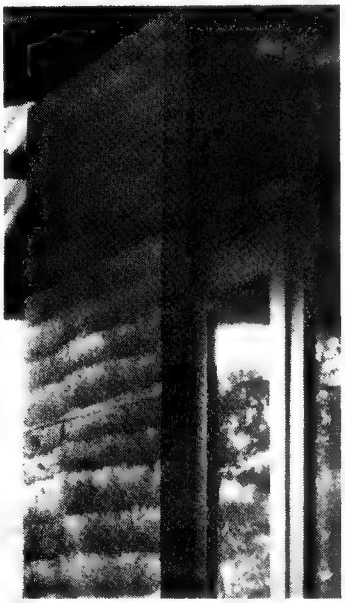
☐**Ramtec Pty Ltd,** 105 Forrest Street, Cottesloe, WA, 6011. Phone (09) 384 5777.

Long verandahs shade this rammed earth house built by Ramtec Pty Ltd in Swan Valley, Western Australia. Both timber and aluminium door and window frames were used in the building. Photo by Stephen G. Dobson.

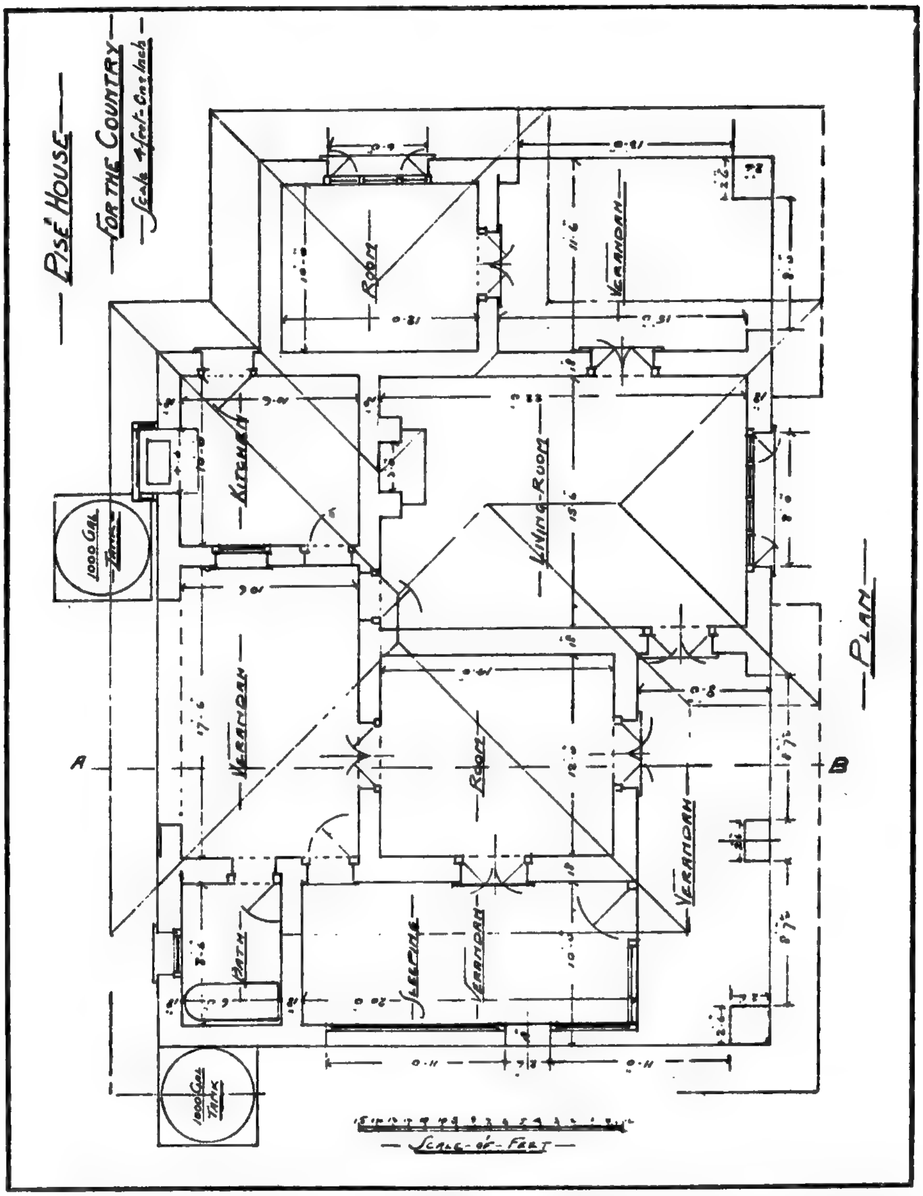
Some of the stabilised rammed earth buildings constructed by Ramtec in Western Australia. Above: This two-storey house on a farm at Bindoon has stabilised earth floors and foundations (also a rammed earth tennis court). Top right: Plumbing and windows are easily incorporated into earth walls. At right: St Thomas Moore Cathedral, Margaret River. Earth was rammed into forms above the lintels of the pre-cast concrete arches. Below: Infill stabilised earth walls rammed around a steel frame cool vats and casks inside the Pierro Winery at Willyabrup. Below right: Even a newly completed rammed earth wall has a texture like natural stone.







1930s — Dab, Pug & Pise



HARD TIMES PISE

These two articles on pise construction were printed in the *Queensland Agricultural Journal* during the Depression, in 1931 and 1937. Rammed earth was a cheap, labour-intensive building method for those Hard Times. The techniques of wire netting 'wattle and dab' and 'pug' mentioned are fascinating. It all makes an interesting comparison with our two preceding 'state of the art' stories.

These documents fall chronologically between *Pioneer Pise* (1911), reprinted in *Earth Garden 16* and *Essential Earth Garden*, and G. F. Middleton's *Earth-Wall Construction*, (1952), which we first reviewed in *Earth Garden No 2* (1972).

PISE CONSTRUCTION OF FARM BUILDINGS

By Officers of the Department of Agriculture.

Reprinted from the *Queensland Agricultural Journal*, July 1, 1931

In many country districts, especially when far removed from the railway, it is difficult, and often very expensive, to obtain usual building materials, such as bricks, cement, iron, and even sawn timber. In such cases it is useful to know how to utilise to advantage a material that can be found almost anywhere, and which costs nothing except the necessary labour to procure it. Earth can be used in several ways for walls, and if properly manipulated generally affords satisfaction.

One method of using earth, adopted largely in Mexico and South American States, is that known as Adobe (pronounced Doby), which is really nothing more than sun-dried bricks, or blocks made of earth and clay and allowed to remain before use a sufficient time for them to become thoroughly hard. This material has been used in that form for hundreds of years in the countries named, and buildings still exist in good order after 200 years' exposure to the elements.

There is, however, more labour in handling Adobe than in the more modern method of pise construction. In the latter case one handling is sufficient, as there is no waiting for the bricks to dry before using in the wall, pise being built *in situ;* drying is not therefore necessary. But even when using pise it is an advantage to have a few blocks of Adobe handy for use in different positions, such as corners, fireplace openings, etc.

Another useful method is known as Pug, or a mixture of chopped straw and mud, or, in some cases, long straw or grass may be used, thoroughly mixed with well-wettered earth in a hole in the ground; for mixing, a long fork or hoe is used, but if on a large scale, horse or some mechanical power should be available. No special appliances are required for this method of construction, as the material, after preparation, is simply laid on in successive layers about 12 in or 18 in thick, keeping them as upright and true as possible. The walls are then trimmed down by the spade or other suitable tools, and made all of one thickness and perfectly true and perpendicular. As the material is put together in a fairly wet condition, there is a certain amount of shrinkage, but it consolidates into a very hard mass and becomes very durable — warm in winter and cool in summer. The general wallwork can be done with unskilled labour , with proper supervision, but a skilled tradesman is necessary to cut out or trim up openings for doors and windows, and to keep the angles plumb. Very good and durable buildings can be erected on this system in the back country.

Ant-bed should prove an excellent material in districts where it is available in any quantity.

It is noted that an admixture of earth and clay is advocated. Clay, owing to its characteristic of expansion and contraction in wet and dry periods, respectively, has its drawbacks. In practice, a fine soil, free from sand or clay, is found to give the best results. A soil which, after being dried out, is difficult to reduce by agricultural methods to a fine tilth — unless crushing or rolling is adopted — is a desirable type.

Another type of earth building is somewhat akin to that known as wattle and dab, but very much superior. It consists of a framework of saplings set into a sill adzed on the top side and laid on the level ground. The corner and intermediate studs are framed into the sides, the intermediate about 3 ft apart, with heads and sills to doors and windows. Both the outside and inside of the studs are then covered with 1½ in mesh wire netting, which is held together and kept from spreading by wire loops, the length of which is equal to the thickness of the wall. These loops are placed at sufficient distances apart to prevent the netting from bulging. The space between the netting is then filled with very moist earth and rammed. It will be seen that the walls will be just the thickness of the saplings or studs. These walls can, if necessary, be plastered on both sides, as the wire netting forms a good key for the plaster, then white washed or coloured as desired.

In some situations this type of building would be very serviceable, and if a little skilled attention were paid to the roofing, which might be of bark laid symmetrically and whitewashed or coloured, a very comfortable residence would result.

The type of structure, however, to which attention is specially directed, and to which the following specification refers, is that known as pise, which combines all the good qualities of the others and may be erected by any person in the bush who is handy with tools and can use the level and plumb bob.

The accompanying drawings are intended to illustrate a house of this character, and, in order that the process of building may be thoroughly understood, the specification is written in plain language, avoiding technicalities as far as possible.

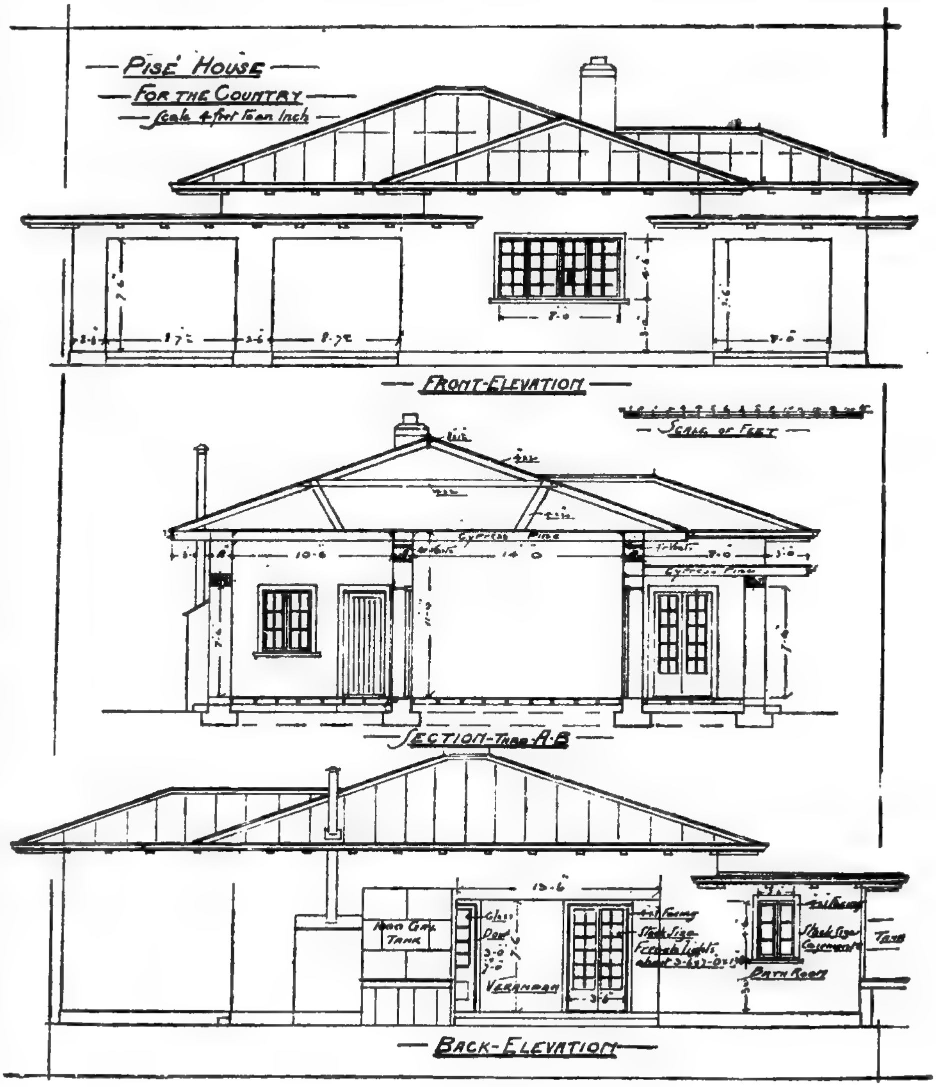
Where heavy rains are experienced, a modification of the roof system may be desirable, in order to give the walls greater protection from the elements. The bungalow-type of roof, with wide, overhanging eaves, lends itself excellently to pise constructions.

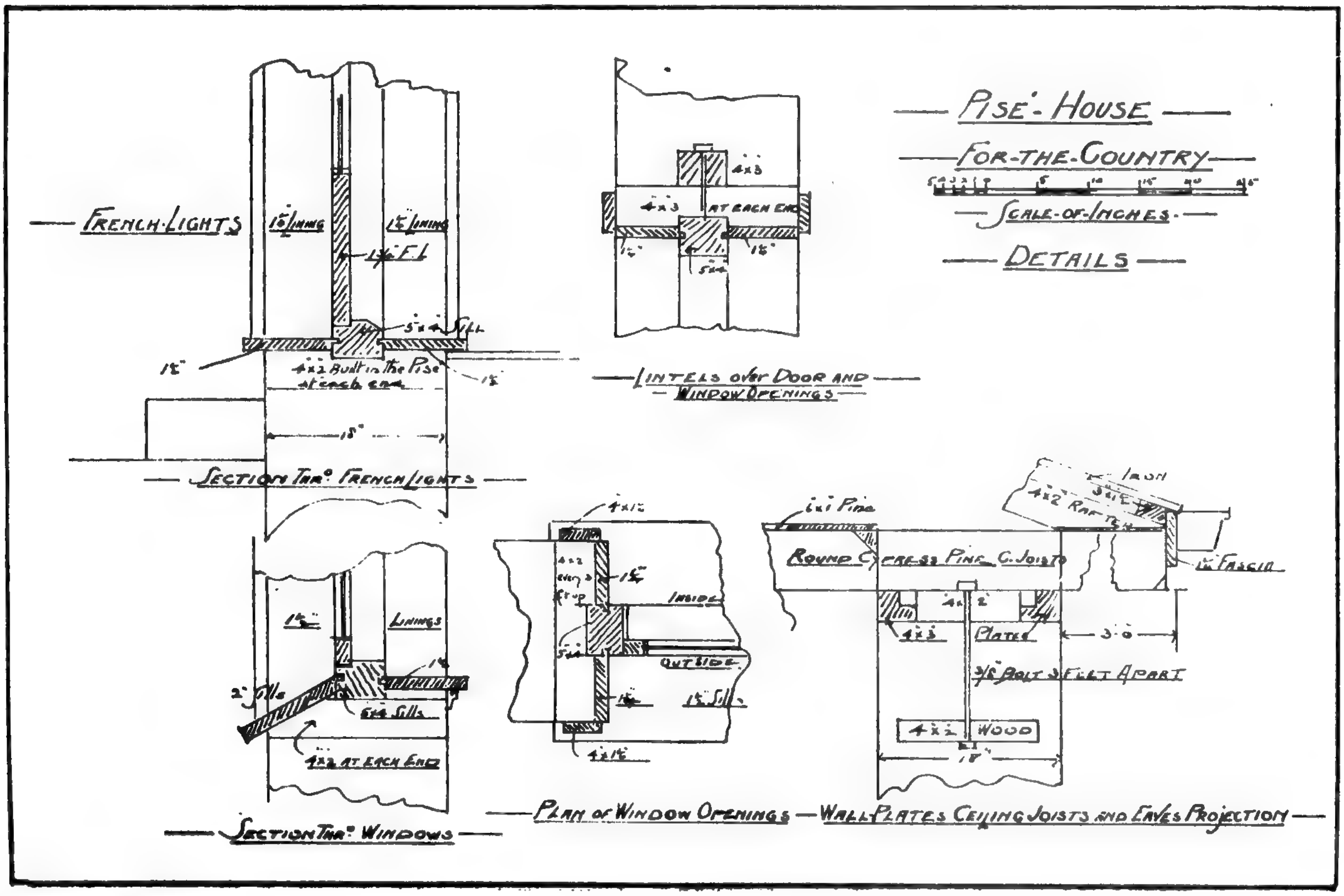
Plant and Materials

Before commencing operations, the builder should provide himself with mould for the walls, rammers and other necessary articles, as he cannot perform good and durable work without them. The plant required will depend on the number of men employed, and, as three is the minimum number to perform the work economically, the following will be necessary: — A horse and dray or some other means of transporting the material to the building, two wooden rammers, two plasterers' wood floats, two straight boxes, or moulds, two angle boxes, some short lengths of light wood for blocking up the ends of boxes, a supply of sawn scantling of different sizes, some 3/8 in bolts, nuts and washers, gauge rods, shovels, spades, a watering can, buckets, tank or barrel for water, and some other articles which will be necessary as the work proceeds.

Foundations

After collecting the plant and fixing the site, the first thing to do is to prepare the foundations. To do this the building must be accurately set out and the correct position and thickness of all walls pegged out, the pegs being put in about 3 ft outside the intersection of walls, so that they are not disturbed when excavating the footings. It may be well to point out that, in setting out buildings perfectly square with walls at right angles, a good-sized square is necessary, which can be easily made by anyone out of long battens or flooring boards. The correct angle is assured by measuring one side 6 ft, the other side 8 ft, with the hypotenuse or diagonal between the above points exactly 10 ft, or any

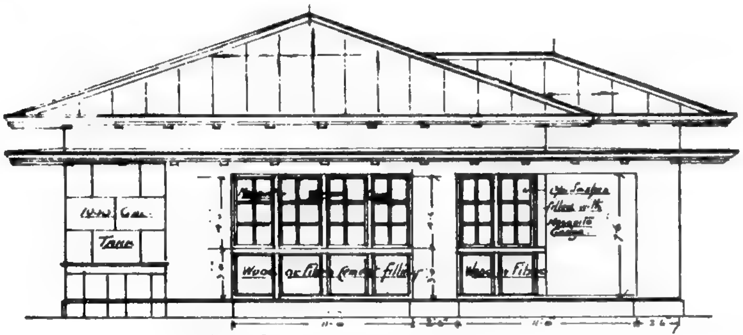




multiple of the same.

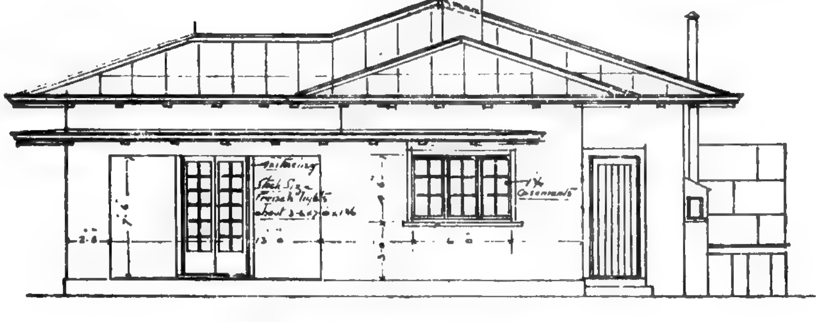
The footings of all walls should not be less than 9 in wider than the walls they carry, projecting 4½ in on each side. In suitable ground they need not be more than 4in in depth, which will be obtained by taking off the top sod to that depth. If the ground slopes, the footings should be stepped; that is, they should be excavated level for short distances, that a step should be left, and another length taken out level. These footings should then be well watered before placing any material in them; when filled in, they should be well rammed and made quite level and flat on top.

Before proceeding with the walls, the boxes or mould must be prepared of any convenient size and of any kind of wood that will not twist or warp, the lighter the timber the easier it is to handle. It will be found generally that 2 ft is a convenient depth for boxes for ordinary buildings, but for large buildings 3 ft may be a more suitable depth. Twelve inch by 1½ in boards, with ledges on the outside, will be found convenient, and broad ledge or brace should be placed at each end. The ledges should be about 2 ft apart, and ½ in iron bolts, long enough to go through the walls, with heads, nuts



— Side Elevation to the Left —

— Pisé House —
— For-the-Country —
— Scale 4 feet - One Inch —



— Side Elevation to the Right —

and washers provided for bolting the boxes together. A set of one dozen iron angle-brackets should also be provided for securing the boxes at angles, otherwise it will be difficult to keep the angles plumb and true. Care must be taken in fixing the boxes to have them perfectly level and plumb, and a little time and patience in accompanying this will often save much annoyance, resulting from the walls being out of plumb.

The door and window frames should also be prepared and ready for use when required, as they should all be built in as the work proceeds.

The next thing to do is to remove the turf from the ground and give the earth a fairly good soaking with water, so that when pressed together in the hand it will adhere and form a solid mass. It must not, however, be too wet, or it will not compress properly when rammed. All roots and timber should be taken out, also all large stobes. Fill in the boxes from 6 to 12 in high at one time, and well ram the same. The wall will then set firm and hard, and be impervious to storms.

A Damp Course Necessary

The provision of a damp course must not be neglected, as the ground moisture will gradually rise by capillary attraction, and cause discomfort in the rooms. This will probably not be noticed for a long time after completion, but as the earth is always more or less damp, sooner or later, unless prevented by some means, its effects will be seen and felt. In brick and stone buildings special damp-proof courses are built in, just below the ground floor level; and in pise construction a good damp course may be formed by building in the wall, for its whole width, just above the ground line, a sheet of malthoid (1 ply) which will be thoroughly effective. This should be carried through all door and French light openings, and lapped 6 in at joints.

General Specifications

All door and window openings should be boxed up carefully as near as possible to the finished sizes, so that little or no patching up will be required.

Cypress pine plugs should be built in all door and window jambs, heads and sills, as shown on detail drawings. These are necesary for securing frames and linings, and to a large extent make subsequent plugging unnecessary.

All openings should have Cypress pine lintels, having at least 1 ft bearing on the walls at each end, those over verandah openings to be whole logs adzed on the underside, resting 18 in on the wall at each end, each face of the same to have stout nails driven in a few inches apart, which will form a key for a plaster cover. The faces of these lintels may be lined with Cypress pine, or they may be covered with cement compo, or lime plaster with a small quantity of cow's hair mixed in same; the nails before mentioned will form a key to hold in to the timber, and, when floated off with a wood float and finished with the pise wall, will be durable and effective.

In districts where cement can be conveniently obtained, the heads and sills of ordinary openings could be made of cement concrete in the proportion of six parts gravel, containing a good proportion of sand, and one part of cement. These could be reinforced and made very strong by inserting in same a few strands of barbed wire turned over at the ends so as to prevent them drawing out.

The fireplace should be faced with brick or concrete, the hearth laid with cement, and the chimney built either of brickwork with a 9 in flue or of concrete with a 9 in drain pipe built in for the flue, finished on top with a flue pipe projecting about 6 inches above a bevelled cap.

All the pise walls — both sides — should be lightly sprinkled with water and worked over with the wood float, using screeds where any straigthening is required.

The top plates should be secured in position on the walls, as shown in detail drawing.

Openings to be left in all walls for ventilation just below the ceiling line, by building in boxes specially prepared and of suitable sizes, ventilators to be not less than 2 ft in by 1 ft 6in, and to be placed generally over doors and windows.

Build in woodplugs 4 in by 2 in and thickness of the walls at internals of 3 ft for securing skirtings, dados, picture rails, architraves, etc.

All outside walls to be twice coated with limewash containing half a pint of linseed oil to each gallon, and inside walls to be coated with limewash, but coloured by the addition of any suitable dry colours.

For a better painting job, a coating of the exterior walls with boiled oil in which pigments of the desired shade of colour have been mixed, is advised. The boiled oil forms a distinct skin, which in itself is a protection. Inside walls may be coloured with cold-water paints, of which many beautiful shades are on the market.

A Pise Cottage

An Attractive Pise Dwelling

By A. E. Gibson

Reprinted from the *Queensland Agricultural Journal,* August 1, 1937.

The merits of adobe or pise structures, particularly where, for transport or other reasons, wood, brick or concrete forms of construcion are more or less impracticable, have been discussed previously in this Journal (QAJ, July 1, 1931).

Quite recently the construction of an attractive pise dwelling and farm outbuilding at Woodridge by Mr S. D. Galletly was under the notice of the Department of Agriculture and Stock.

Some two years ago Mr Galletly conceived the idea of utilising pise for the construction of a homestead and submitted samples of soil from his poperty to the Department for mechanical analysis. These tests proving satisfactory, he commenced building operations and gained valuable experience during their progress. Today, Mr Galletly is the proud possessor of what is undoubtedly an attractive homestead, delightfully cool in summer and warm and cosy in the cold winter weather; and he has demonstrated successfully what can be done by an energetic man from materials close at hand.

The timber used in the building of the house was milled from hardwood timber grown on the property. Mr Galletly has courteously supplied a ground plan of his house, together with a list of materials and details of the sizes of timber used; and these are submitted with the idea that they may be of guidance to those who are contemplating the erection of a house but to whom the idea of pise constuction has not previously occurred.

MATERIAL REQUIRED FOR COTTAGE AS DESIGNED

Walls 10 feet high.

Main Building

Doors and widow frames — 22/10 ft — 8 in x 2 in.
Top plate — 100 lineal ft — 4 in x 2 in.
Ceiling joists — 11/16 ft — 3 in x 2 in.
Rafters — 21/9 ft — 3 in x 2 in.
Purlins — 200 lineal ft — 3 in x 1½ in.
Ridge pole — 34 lineal ft — 6 in x 1 in.
Gable studs — 50 lineal ft — 3 in x 2 in.
Ceiling — 800 super. feet.

Pise farm homestead designed and built by Mr Stewart Galletly.

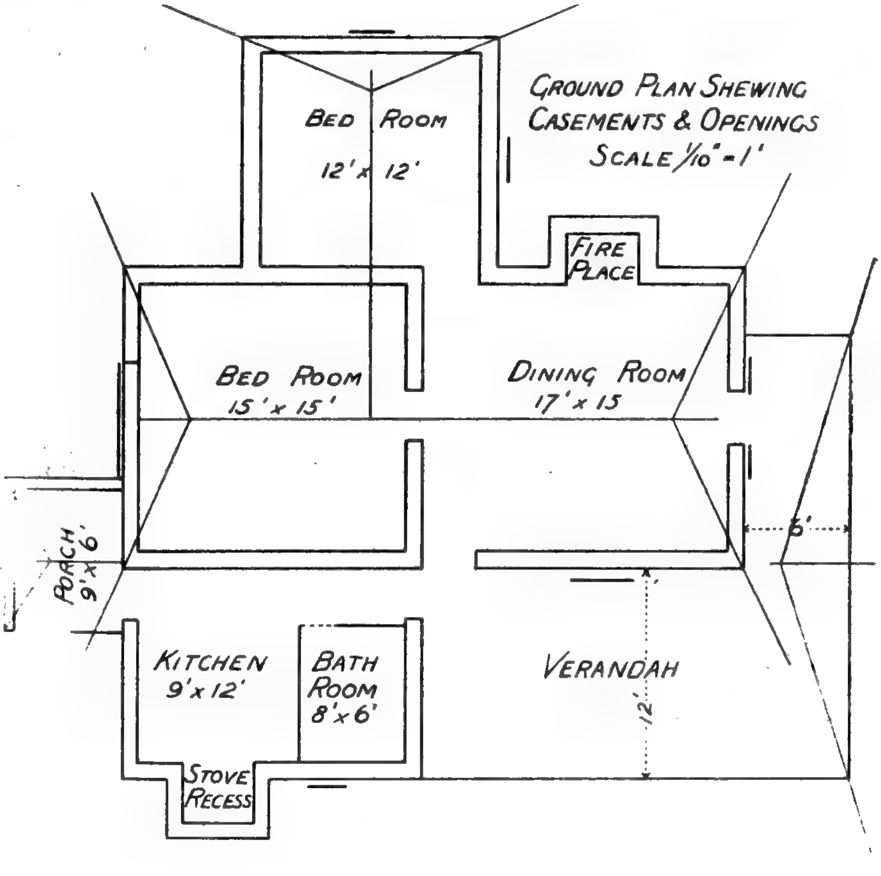
Iron — 34 sheets — 9 ft.
4 Doors, 2 Casements — 6 ft x 1 ft. 6 in; 2 — 4ft x 3 ft; 1 — 4 ft x 4 ft.

Side Gable Room

Ground plate — 3/12 ft — 4 in x 3 in.
Floor joists — 5/12 — 4 in x 2 in.
Flooring — 175 super. ft hardwood.
Ceiling joists — 5/12 ft — 3 in x 2 in.
Rafters — 10/8 ft — 3 in x 2 in.
Purlins — 80 lineal ft — 3 in x 1½ in.
Ridge pole — 1/20 ft — 6 in x 1 in.
Weatherboards — 36 — super. feet.
Ceiling — 8 sheets three-play, 100 lineal ft. cover strips.
Iron — 30 sheets — 9 ft.

Veranda, Kitchen, and Bathroom

Ground plates — 3/24 ft, 3/6 ft — 4 in x 3 in.
Floor joists — 10/12 ft — 4 in x 2 in.
Flooring — 400 super. ft. hardwood, shot edges.
Verandah posts — 6/8 ft — 4 in x 4 in.
Veranda plate — 1/64 ft lineal — 6 in x 2 in.
Rafters — 18/12 ft 6 in — 3 in x 2 in.
Pole plate — 1/42 ft — 3 in x 2 in.
Purlins — 250 lineal ft — 3 in x 1½ in.
Gable studs — 25 lineal ft — 3 in x 2 in.
Weatherboards — 75 super. ft.
Partition — 8 sheets three-ply.
3 doors, 2 windows.
Iron — 50 sheets — 6ft.
Flashing — 42 ft.
20 lengths of spouting.
10 lengths ridgecapping.
2 tons cement.
1 roll ruberoid.
Nails, paint, paper, etc, not shown.



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ABC, Sydney, 1985, paperback, 168 pages illustrated. Price $10.95, from ABC and other bookshops.
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Who could possibly have as much to learn about such a variety of regulations, disciplines, knowledge of materials, jobs and skills as someone setting out for the first time to build their own home? If the joys and disasters of building are still ahead of you, I suggest that you add this book to your small library of essential references.

Experience can only follow the doing. However, you can at least forestall some possibly costly or even heartbreaking mistakes by reading these accounts of the experiences of Australian owner builders. They've done it, so the how, what and why, the ideas which worked or didn't work and the problems and pitfalls met with are doubly valuable.

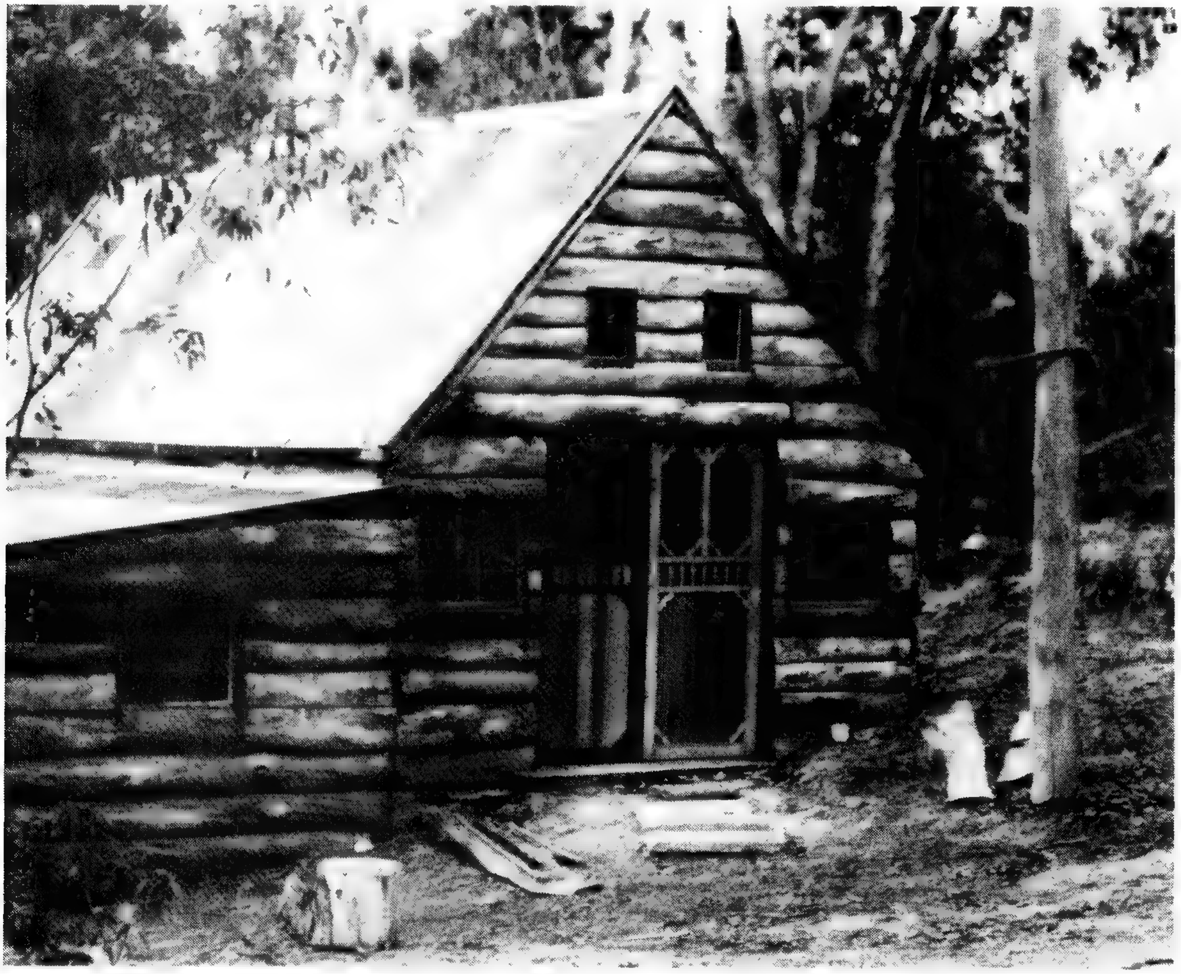
Owner builders of all kinds talk about their homes of all kinds, sizes and shapes — of mudbrick (predominantly), stone, wattle and daub, timber, fired brick, concrete and even tractor crates and rocket boxes — from traditional to passive solar. For inspiration, excellent black and white (and some colour photos) accompany the text, which John Archer has drawn mainly from interviews in his ABC Radio series *From Domes to Dugouts* and articles in *The Owner Builder* magazine.

Lack of experience is a big problem for many owner builders. Often they don't understand the time it will take, either. They've got the design all organised and they're all enthused and optimistic but they often have no idea of the time and dedication that building demands — sometimes for two or three years if you're inexperienced.

It's quite a big step — finance comes into it, too, and it all costs far more than they expect. Most people start off on far too grand a scale. They should build first the minimum that they require — perhaps just sleeping accommodation and a small kitchen and bathroom . . . Then as their needs grow, so the house can grow — Les Fisher.

• • •

The rendering (of wattle and daub walls) was hard, tiring, dirty work, and because Bondcrete is a glue it tends to stick to your skin and hair. I remember working in the lounge room one stinking hot January day and I did the wall four times with mud, sometimes by hand and sometimes with an old, worn, bristle paint brush. I worked quite late and I didn't have to go to work the next day so that night I went to bed absolutely covered in mud. I thought, "I'm not going to get washed tonight because I've only got to get up and mix mud first thing in the morning". I lay there exhausted and decided to wash the sheets the next day — Vicky Broome.



Vicky Broome's renewed log cabin pottery with stained glass windows.

Mudbrick manual

How to Build a Mud Brick House

A Step-by-Step Guide

Gregory Ah Ket, Currey O'Neil, Melbourne, 1985, hardback, 140 pages, illustrated. Price $19.95

Gregory Ah Ket was at the forefront of the modern self sufficiency and earth building revival in Australia. His company, Compendium, republished the G. H. Middleton classic *Build your house of Earth* in 1975 and then went on to print other influential titles by John Archer, Alistair Knox and Neil Douglas and Abigail Heathcote.

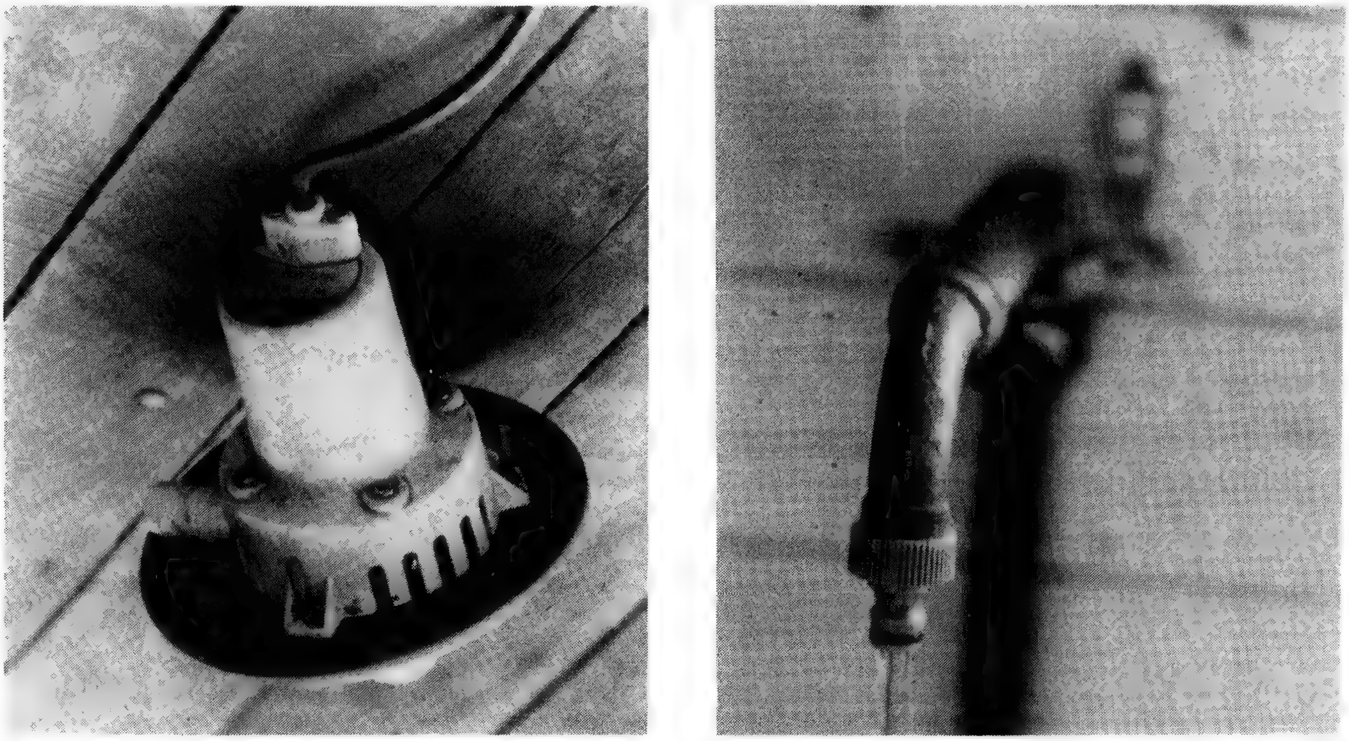
Now, 10 years later, Ah Ket has produced his own work on mudbrick building. It is a handsome book, but disappointingly not an original one, being based extensively (as acknowledged) on text and illustrations adapted from these earlier books. Other material comes from the Experimental Building Station publications, Ron Edwards, the CSIRO and *The Owner Builder* magazine.

There are some unacknowledged borrowings, too. For example, why, in a place like Australia, where hundreds of mudbrick homes are being built, was it necessary to redraw (on pages 56-57) a series illustrating mudbrick making taken from a **South American handbook,** itself originally printed (without credit) in Owner Builder No 3?

This is still a handsome book and good value for anyone planning to build mudbrick. Colour and black and white photos show fine examples of how beautiful and functional well-built mudbrick homes can be. The text covers choosing a location, ideas, plans, soil selection, foundations, mudbrick making and laying, doors, windows and wall finishes. A drawback is that this book is about mudbricks and nothing but mudbricks. Other techniques, such as rammed earth, are dealt with only in passing in a couple of paragraphs while only a few details of standard building procedures are given.

To my mind, Middleton's book, as revived by architect Bob Young (now published by Second Back Row Press), remains the best on earth building in Australia.

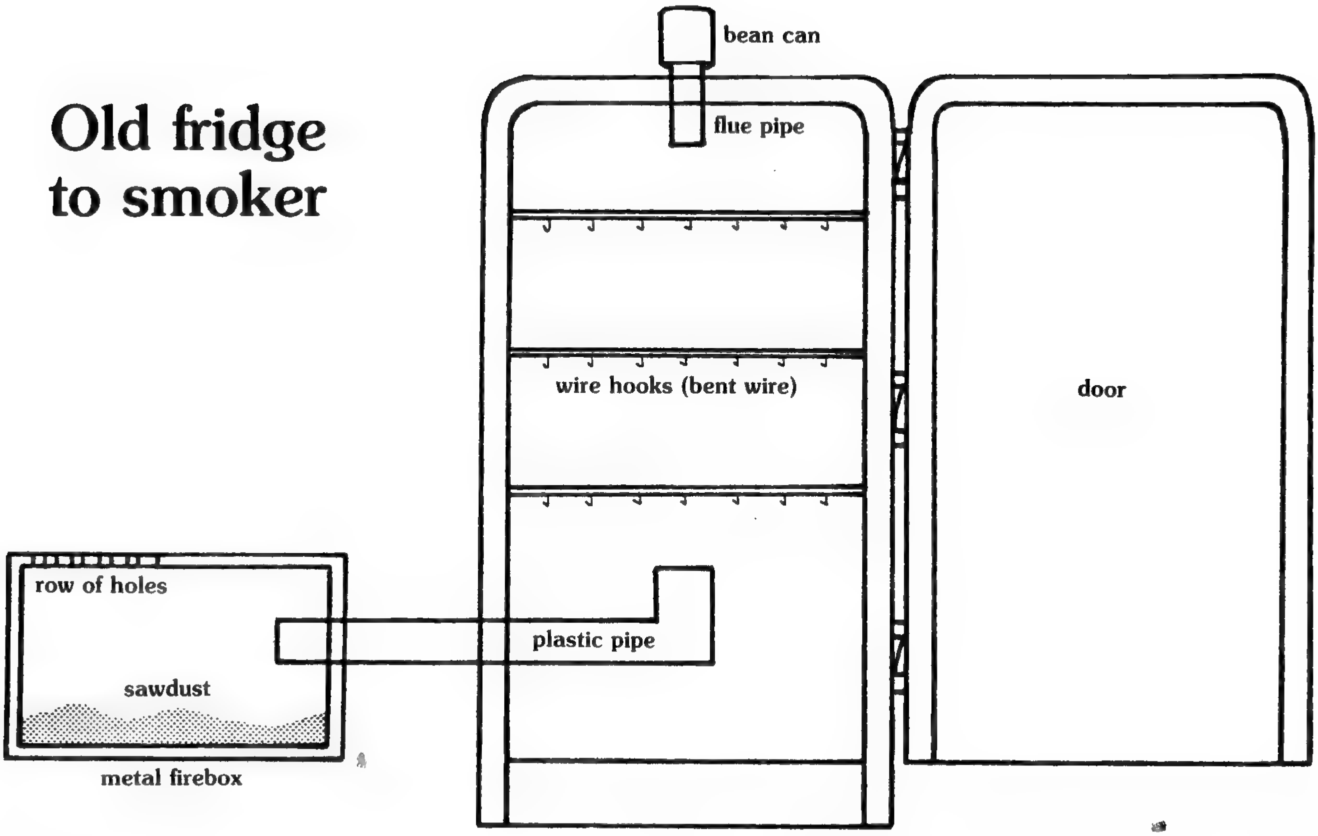
Sometimes people are concerned about the resale potential or market value of mud brick houses in general and owner-built examples in particular. As previously mentioned, there are now tens of thousands of earth-wall houses in Australia (most of them mud brick, but some of rammed earth) . . . experience has shown that in terms of market value mud brick houses more than tend to hold their own with other types of houses. Indeed, in Eltham and nearby areas of Victoria, several decades of experience have shown that a mud brick house will often sell for considerably more than a brick veneer house of similar size and with comparable features. As regards durability and long-term investment, mud brick actually tends to harden and improve with age.



HOUSE WATER FROM A 12V BILGE PUMP

This is a kind of photographic postscript to Peter van der Wyk's article in Earth Garden 46 (pages 16-17) describing his 12V bilge pump which provides house water from a tank. Photo at left shows the King bilge pump Peter used. At right is the plastic hose used in place of a tap. Water delivery is controlled simply by switching the pump on or off.

Old fridge to smoker



By Shane Rowley

Smokehouses have been used to cook and preserve food for hundreds of years in many cultures and in many forms. For us today the main requirement is that a smokehouse should be weatherprooof and reasonably airtight to keep in the smoke.

An item that many people throw away which does both these things well is an old refrigerator.

First remove the motor from the bottom section of the fridge and discard it. Make sure you do this in the open air, because motors are often still 'gassed up' and gas will escape.

Drill a hole in the top of the fridge to take ¾ inch conduit or any similar pipe for a flue and cover this with a can, as shown. This slows down the smoke, but doesn't altogether stop the flow of air.

Drill a hole in the side (or bottom) of the fridge to take ¾ inch plastic stormwater pipe. If the hole is ragged or the pipe fits poorly, simply fill in the gaps with body putty or any filler. One elbow or bend will be needed here.

Firebox: A square kerosene tin or any metal box that is airtight will do for the firebox. A slit or a row of holes drilled in the top of the firebox will allow some control over the fire. Simply cover it with a strip of metal and cover or uncover enough holes to ensure that the sawdust will burn.

Talking of sawdust, spotted gum is good, but any timber without gum or resin will do the job.

Some tips. I don't want to go into the technical details of smoking, but a few ideas that might start you thinking will help

Plastic pipe seems to be okay, even in the firebox, and doesn't melt, so there is no smell. But keep sawdust away from the end of the pipe so it doesn't catch alight.

Make sure the refrigerator door closes tightly for smoking and add a childproof lock for safety.

The illustration shows hooks for hanging food from the refrigerator racks. They are simply made fom bent wire.

Hot and cold smoke: The experts talk about hot and cold smoking. If you are going to eat food straight away, smoke can be hot. If you want to preserve it for any length of time, smoke must be cold. The distance between the firebox and the refrigerator smoker is the deciding factor, up to 25 feet away for cold smoke.

Salting: Meat may be salted by adding coarse salt to water until a potato will float in the brine. Hang the salted food out to dry by pinning it up on a line (like the washing). Flies and bugs won't touch meat which has been soaked for 24 hours, but it must be absolutely dry before smoking.

Tucker: You could start by smoking sausages, lamb chops or any kind of fish, especially Tailor. Even if you aren't preserving food, a couple of hours smoking before barbecuing or cooking adds a great taste.

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The third skin

Dieter Groening and his family were using natural paints and varnishes in Europe 10 years ago, but found them impossible to obtain anywhere in Australia after emigrating and starting to build a home in South Australia in 1983.

So was born the idea of importing a range of natural paints, varnishes and lacquers, stains and polishes which will hot harm humans or animals.

For further information write to Bio Products Australia Pty Ltd, 25 Aldgate Terrace, Bridgewater, SA, 5155.

Natural stains and treatment for timber

By Dieter Groening

Natural building and living is becoming increasingly more important to counter the plethora of chemical materials used in modern construction and lifestyles. We spend more time indoors than in the past and our walls have become a 'third skin', playing an important role in our living environment. It is therefore important to look for building materials which do no harm to humans and pets and which promote a healthy lifestyle.

Why natural products? Modern man has incorporated many new technology products into his daily lifestyle. Slow, continuous poisoning of the environment has been the unfortunate result of a chemical consuming society. We are just now awakening to this self-inflicted threat to our own well-being. More and more the question of and desire for, natural products arises — products which are harmless to us and to nature, which brings our needs and nature's into harmonious balance.

What are natural products? The term natural products should have two principle criteria:

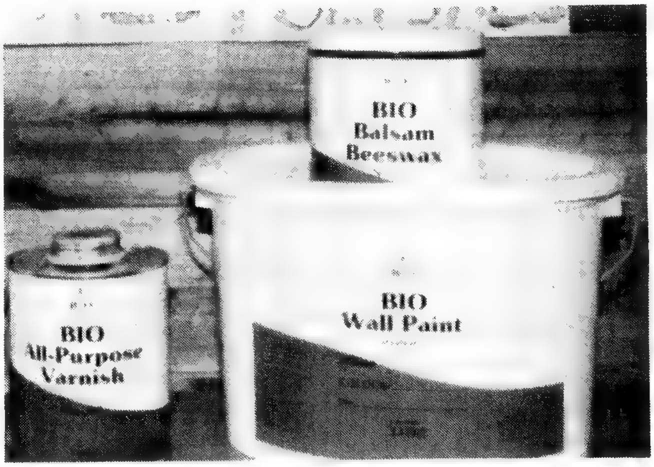
- The raw materials must be acquired without over-exploitation of nature and must be of a reproduceable standard.
- The manufacture and handling of the products should not contribute to the depreciation of nature, nor should their natural quality be degraded.

Natural products of paints, varnishes, stains, polishes and wood preservatives are now available through Bio Products Australia Pty Ltd.

There are a great many high technology efficient wood preservatives, paints, varnishes, cleaners, etc on the market today. Past development has been dependent on the chemical industry, orientated towards industrial norms, with a basis in scientific demands and research. As in the pharmaceutical industry, product side-affects have remained undetected. or generally accepted as a normal aspect of our lifestyle. Fifty years of this attitude have culminated in the health dilemma which stands before us. Man and nature are dangerously threatened by the consequent allergies, abnormalities and mutations and poisonings of the natural and home environments.

Proven poisons are only seldom prohibited in household product manufacture. The definition of acceptable limits is often based on political and economic issues, rather than scientifically derived knowledge.

Furthermore, although the use of some substances is forbidden in our society, their production and export to Third World countries is permitted. These chemicals, such as DDT, are returned directly to our food chains via market produce.



Wood preservatives generally contain well-known, highly-poisonous substances, including polychlorinated phenols (PCP and its derivatives), organic compounds such as Tributyltnoxide (TBTO) and chlorinated carbon compounds, such as Chlordane, Dieldrin, Dioxin, Lindane, etc. These contact poisons are drastic environmental dangers, especially since they are not biologically degraded to non-active forms, and may be broken down into even more deadly compounds. The poisonous effect of these chemicals in different concentrations to humans, animals and plants are currently being described.

Natural paints, varnishes, polishes and wood preservatives are produced with the current state of chemical and poison knowledge in mind. Only raw materials with the following characteristics are used:

- those which can be produced from nature
- those which nature can replenish
- those which after production can be returned to the natural cycle
- those which cause only the most trivial effects on workers and environmental through production and use
- those which produce insectidices and fungicides which rapidly repel and eventually eradicate the infestation
- those which do not threaten the user's health.

Wood must also be protected from ultra violet light, weather and environmental stress, as well as mechanical wear and tear. Raw materials with the following characteristics are used without exception:

- Those which nature continually replenishes, such as oils, resins, waxes, balsams and plant pigments.
- Those natural materials which, through all-natural processes, acquire high quality technical properties.
- Those which produce harmonic colour spectrums via their natural pigments components.

When used as prescribed, these products can be as durable and stable as the traditional chemical products. When accompanied by procedures of comprehensive natural living and building these standards may even be surpassed. These products can help to maintain the health and balance of nature, while providing protection and care for the house, yard, garden and human beings.

Rainforest plants

Australian Rainforest Plants

In the forest & In the garden

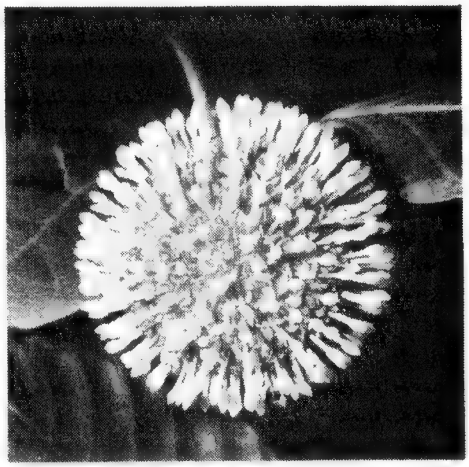
Nan & Hugh Nicholson, Terania Rainforest Nursery, The Channon, 1985, soft cover, 72 pages, colour photos.

☐Price $9.95 from bookshops, or add $1.50 for postal orders from Terania Rainforest Nursery, Terania Creek Road, The Channon, via Lismore, NSW, 2480 (10 per cent to the retail price goes to rainforest conservation).

This book contains 110 colour photos clearly showing 97 beautiful species of rainforest plants (trees, shrubs, climbers and ground covers) with a description of where and how the plants grow in the wild and how to grow them in home gardens.

Hugh and Nan Nicholson were key **figures** in the successful campaign to save the Terania Creek rainforest from logging (see Earth Garden 14 — February 1976) and since then have acquired much practical experience with propagating rainforest plants at their nursery. With this book they give all Australians the chance to dip into the vast genetic pool of our native rainforests.

- The total area of rainforests of all types in Australia can be represented by a solid circle of 80.27 kilometres radius.



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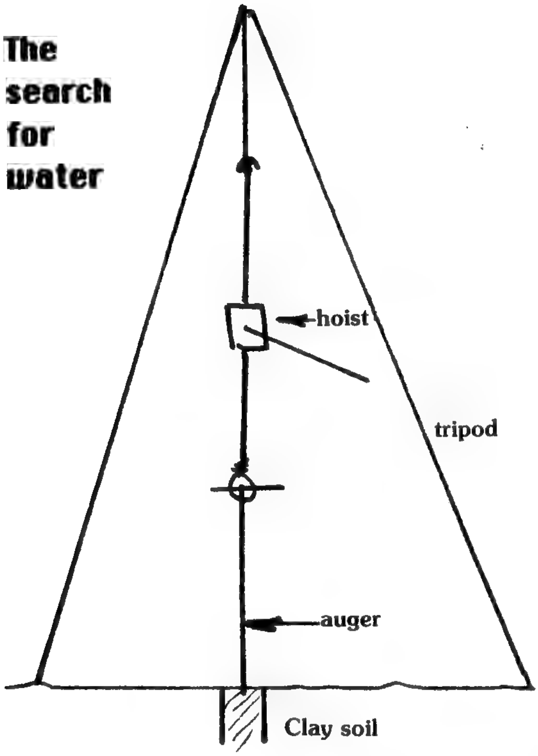
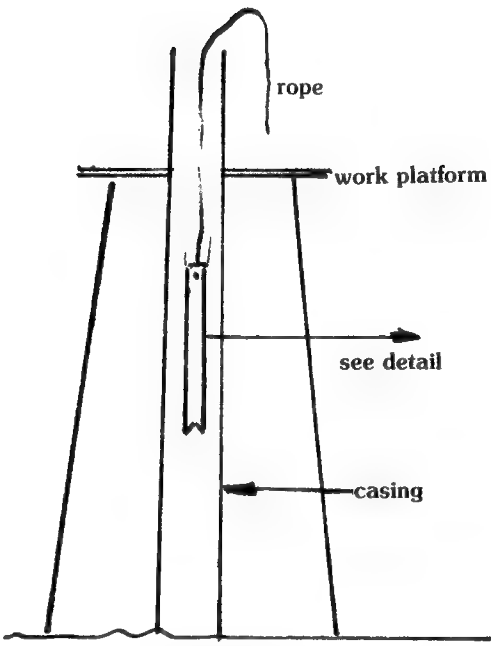
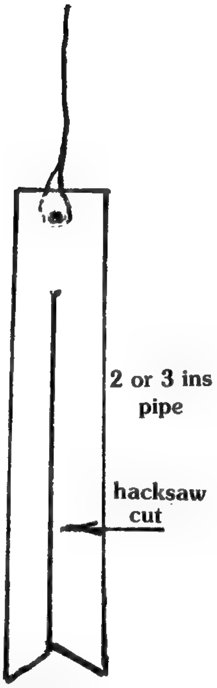


Clay soil



Sandy soil



Sand auger

HAND~DUG WELLS

By Noel Jeffery

When staying at my brother's home eight years ago, I noted that he was always buying water. As I had done a little geology and surveying previously, I thought it was worth trying something to help. His property was near the Murray River and I knew that there were a number of prior streams. The next property owner had found water 25 ft down, which was also an encouraging sign.

Clay soil: As my brother could not afford drilling fees at that stage, I asked him to bring home a 2 inch auger from work at lunch time. After lunch I began drilling next to the concrete storage tank into a clay soil, keeping water in the hole to reduce friction and to help the soil to stick in the auger. When the handle reached ground level, I unscrewed it and replaced the 4 inch handle with a 20 ft length of ¾ inch pipe, as that was all we had.

I fixed a ladder to the side of the tank as a kind of derrick, with a loop around the top of the ladder and the length of pipe to stop it toppling over when out of the ground. I climbed up the ladder and continued drilling from there, removing the soil every foot or two. I needed to stand on the top of the concrete tanks to get enough pressure to break the suction and lift out the pipe.

At about 18 ft the soil coming up was much damper and by the time the 20 ft length of pipe was in the ground we were getting clayey water which became quite clear after standing overnight. This whole operation took about four to five hours.

My brother then decided to try drilling some 40 ft away on a spot closer to power. Learning from my effort, he made a tripod from 1½ inch pipe, from which he suspended a ratchet tree-puller to break the suction and lift the pipe. He also used 10 ft lengths of pipe, which were much easier to handle. He went down to 40 ft using four 10 ft lengths of pipe. He used a Stilson wrench to turn the pipe. He found that he had good water about 25 ft down. He then used a 5 inch auger to enlarge the hole and cased the inside with 4 inch polythene pipe.

The water is used for drinking, household purposes and to irrigate the house garden. My brother used a ¾ inch Onga centrifugal pump. It can pump all day into a ½ inch hose in the vegetable garden and the water level falls less than one inch.

The method I have described seems to have been useful because the water-bearing layers were below clay and not rock.

Sandy soil: I have since seen people drilling in sandy soil using this method. The driller stands on a platform which is as high as the length of the casing, which he secures vertically, and drops a 2-3 ft length of 2 inch pipe, which is slit for about three-quarters of its length down the centre of the casing, as shown in the sketch.

After several repeats, the driller puts a piece of wood over the top of the casing and drives it down as far as possible. He then removes more sand from the centre and drives the casing down again. I don't think this method could be used through anything harder than sand, but it may be useful for people living near the seaside or in sandy conditions.

Permission for drilling wells should be obtained from the appropriate department, which is often helpful with advice as to where water is likely to be found, or where previous drilling has taken place. A dowser (water diviner) may be able to help you locate water, or you may like to do your own dowsing. Good luck.

Water from the rock

By Dieter Fahland

We bought our property in North Queensland about 20 years ago, with a warning from the owner: "There is no water on that place".

We were not convinced, though those hills were really hungry and dry looking. Our best chance of finding water, we thought, would be in between the first two hills from the spot where our house would be later.

We had the whole area surveyed by several local water diviners, including our neighbour's brother. His divining stick showed water between 55ft and 60ft. Also by holding an old silver "zack" (sixpence) between his teeth, he was convinced that there was also silver down that hole! At about 35 ft we struck solid blue metal rock and that was the end of our confidence as well as that of our neighbour who, despite his age, gave us a hand. The cane harvesting season had started, so he was busy with his own farm.

The next year our neighbour tipped off his nephew, who wanted some extra money. We worked over several months every Saturday and Sunday. Using a large Council compressor and lots of gelignite we drilled, blasted and cleaned the shaft. We fitted a winch over the gaping hole. The winch handle came from an old abandoned well site on our property. Again we were told that there was no water. We did not have to line the well at this stage as the top was sandstone-type soil and down past 35 ft it was solid blue metal. Down we went in turns in an old five gallon bucket which was also used to bring up the excavated ground and rock.

At about 53ft we ran out of money and told our dear workmate that this was the end of our enterprise. But before giving it away entirely, we wanted to at least reach the water diviner's proclaimed depth, so we borrowed a special long drill for the compressed air hammer. After starting with the short bit, we inserted the long one (6 ft long). My mate was down there at the time. A few more minutes and . . . "Yippee!". Water, propelled by the compressed air, sprayed everywhere.

We quickly cleaned up the hole and the next morning we had 3 ft of crystal-clear water in the well. The well was never dug deeper as it gave all the water we wanted, including water for 2000 lettuces which we tried to grow all year, including the rainy season.

However, there was "bad air" in the well as we found out by lowering a kerosene lantern on a rope. At 6 ft the flame died, through lack of oxygen! This also explained why our mate complained continuously about headaches while the well was being sunk, though admittedly we also handled huge amounts of dynamite, which has the same effect. We needed about 50 lbs of gelignite and one shot with fertiliser. In the beginning we used a slow-burning fuse. Later, for safety, we used only electric fuses and a car battery.

In the rainy season the well flooded over. In the following year we lined the well with concrete cylinders. Soon we found an old windmill and fitted it over the wellhead. But being behind the mountain we could not catch enough wind to make it work, eventually, we sold it and fitted a deep well jet pump about 50-years-old which we overhauled. We laid 3/4 inch polypipe up the hill and into old cemented water tanks to supply the house and garden.

We "invented" and fitted an overflow bucket on a fishing line and pulley to switch off the power going down to the pump. We only had to switch it on in the morning and it would switch itself off, even when we were not at home. The pump delivered the water from the bottom of the "tank assembly", so in 15 years we never had a problem with priming. As a bonus we tapped the "rising" polypipe in several places to fit water outlets in the vegie garden, chook pens and so on.

Later, when we needed water in a different location, we hired a small self-propelled drilling rig of the type commonly used in quarry work at about half the cost of a normal drilling rig. Our drilling time was about half, but so was the size of the hole. This time we drilled on the hilltop which, the story goes, sometimes brings good water. We got down to about 60 ft in just two hours through mainly solid blue metal rock.

We overhauled and installed another windmill. As with the drilling rig it pumped well for about two hours and then the apparent "cave" was empty. We dropped gelignite and exploded it into the hole, but still no water. A neighbour to whom we sold part of the property eventually had to go right down to 90 ft to catch the valuable wet.

Eventually we sold our place and retired from our small restaurant. We moved about 200km north, into a quiet valley right next to a huge National Park. Here we were fortunate as we had two creeks running through the property. One creek never dried up and had a beautiful swimming hole in the middle of a tiny rainforest filled with palm trees.

However, when we got the water tested by the local health inspector it was declared unsuitable and dangerous for drinking. We ran it through a Berkefeld ceramic filter which is even supposed to filter out typhoid bacteria. When the builder came with his man they ignored our warning sign and were drinking huge amounts of water without any ill effects.

We contacted a local drilling company and agreed on a suitable location. This well was drilled *under contract,* which is very important as it lessens the risk considerably. If no water (or insufficient water) is found usually only the bare cost of drilling fuel and man hours is charged. The full cost of a producing hole, includng PVC lining, today is approximately $15 per foot drilled, usually of 5 inch diameter.

As he was a local man our contractor knew almost everything there was to know. Using a huge American drilling rig and compressor he took about half a day of actual drilling and we had sufficient water even to work on a small irrigation pump should one of our children decide later on to go into market gardening.

So we established ourselves here, growing a small vegie garden which my wife lovingly tended and establishing a small exotic fruit orchard with the help of our grown up children. We intended to improve things and go back to our old creek water. Times are tougher and electricity is getting dearer every year, so we decided we would pump without it.

Waterwheel pump

Hydraulic rams. We knew about hydraulic ram pumps and the expensive different models. One company, Wilcox Pty Ltd of 197 Bay Road, Sandringham, Victoria, offers one model which is probably sufficient to supply all needs at a cost at the moment of $269, plus $25 or so rail freight. If you are clever with welding and have the time to fossick for information, you can build your own hydraulic ram for considerably less. But the problem with all these types of pumps is that in the end what works is the height of water falling from a higher source. You need a property large enough and in the mountains with *permanent* water of sufficient volume — but we have neither! Solar is out because of cost (we are both pensioners). A wind pump is unsuitable because of the lack of wind in this valley and the surrounding rainforest.

Our solution was a more modern waterwheel. The highest possible fall of water from our swimming hole is about 30 inches at the best of times, but the amount of water coming through was considerable, about 1000 litres per minute, dropping to a trickle in the dry season. The rough result of this measurement was approximately ⅓rd to ½ horsepower (HP) most of the year, except in the rainy season, when we have to dismantle the pump. In theory, we should be able to pump up to about 5000 litres in 24 hours, lifting it about 7-8 metres up to the house and vegie garden.

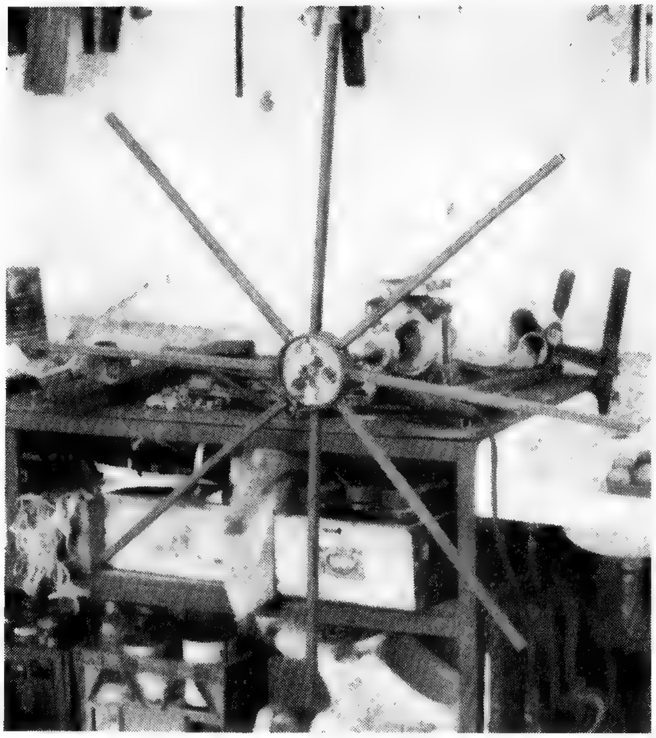
This sounded reasonable in comparison with what a hydraulic ram could do (apart from the somewhat annoying clacking noise it produces). A little thinking and some sketches with pen and paper gave us a rough design with a most suitable diameter for the wheel. The wheel itself was simply bent using only a vice and electro-welded from 20 mm square tubing. Its diameter is about 20 ft. The "buckets", more an open flat "shovel" type, bend only in one direction and are made from 3 mm galvanised iron.

None of these dimensions are critical, apart from the fall of the water. We were lucky to find an old, nearly antique, two stage Thompson pump which was rebuilt with its shaft being machined down to suit. Cost $8.00. The two ball races were still just usable when cleaned and regreased. The whole unit is mounted on a ¼ inch scrap steel plate which also carries the arm for fitting the swivelling "pump block".

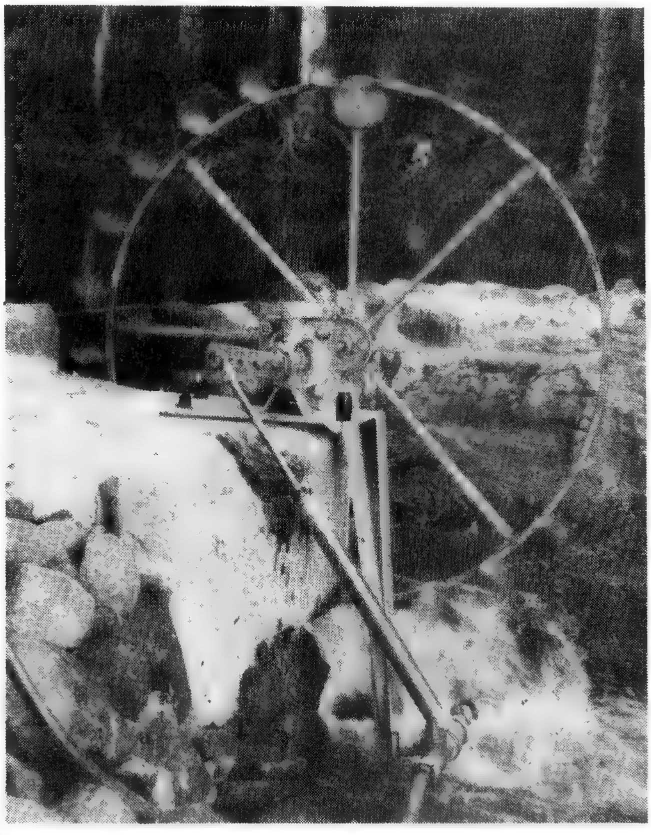
The piston pump came in a packing box and is made by Alderice Bronze Foundry, an Australian company, and cost $48 up here. It is 1 ⅜th in diameter and has two reversed leather buckets. The pump fitted onto a T-section which carries a foot valve on a 1 inch flexible garden hose on one side (fitted underwater, so we get a little pressure onto the pump). The other side has a medium sized one-way check valve fitted directly going into the same garden hose and then into a ¾ inch poly pipe to all the taps needed. There is no tank fitted at this stage.

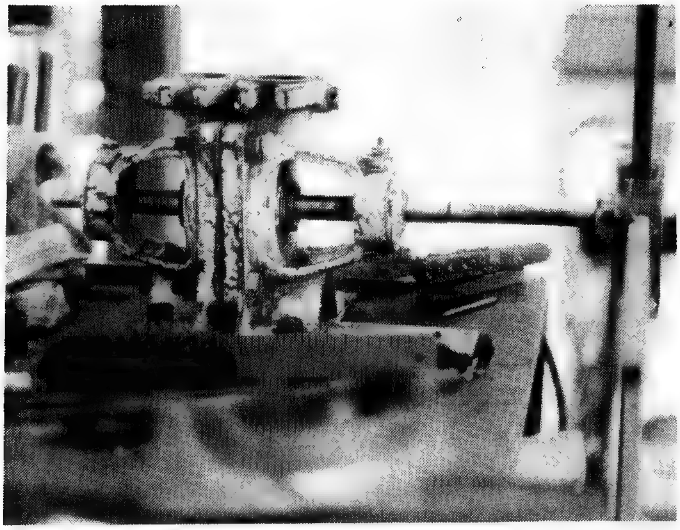
As we are limited in space on our little hill, the ¾ inch pipe is all that we need as there is only a little volume going through. The whole pump body swings on the T-section as the arm on the wheel axle takes it around. We have four positions so as to compensate for the dry season when less water comes through the creek.

The actual pumping action it gives is from 56 mm to 228 mm. Our entire cost without the black poly piping (about $56 per 200 metres) and the necessary taps and so

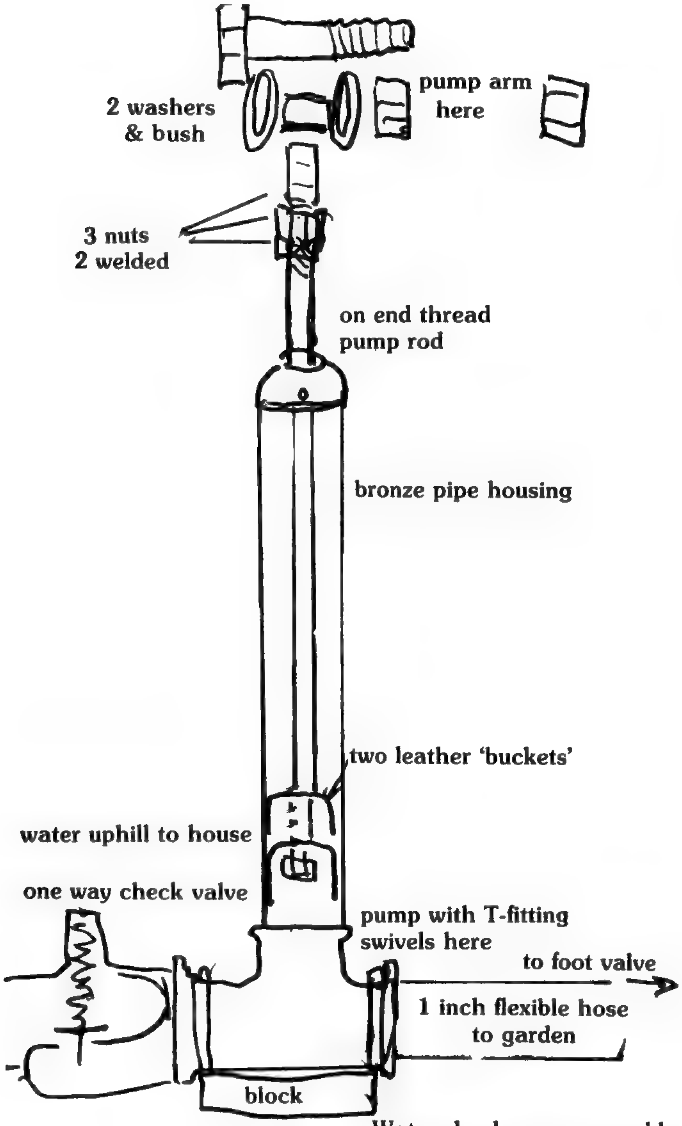


Above: Waterwheel 'spokes' being assembled onto the old converted Thompson pump housing and bearings. The hub is the cast wheel of the pump. Below: Waterwheel installed at the swimming hole. The bronze pump (stuffing box from a windmill) of 1 3/8 in is fitted to a T-Section which swings on the bottom. Each of the 24 'buckets' has an outside radius of 67 cm and inside radius of 56 cm.

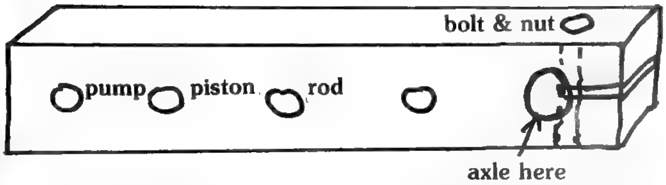




The old Thompson two stage pump being tested for true running on the workbench while being converted to become the bearing block for the waterwheel. Only the axle needed machining.



Waterwheel pump assembly



Pumping arm fitted on axle opposite waterwheel. Four holes 1/2 inch for piston pump rod fitting will give different amount of stroke and water delivery (also HP) with a lower dam level.

on was well under $100. We will recover this within nine months through the electricity we save (a large part of our modest three-monthly bill) as well as having more water available.

At the moment we are investigating a small solar driven "homestead powerplant" to generate electricity through a parabolic mirror system, which we will tell you about at a later time. We will answer any specific questions on our water supply system as far as we can if you include a return stamped envelope.

Excerpt from the testing sheet:

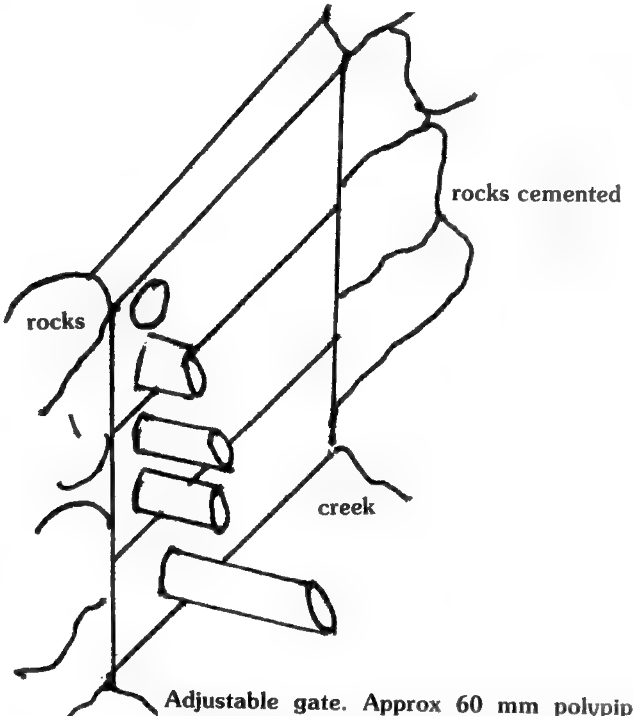
June, 1985. With all "holes" open we now pump 7776 litres in 24 hours, actually measured at the elevated house.

July 2, 1985. Very dry, had to use second largest pump-stroke hole on arm. Closed two top holes in "gate". Pumping now 5981 litres in 24 hours.

July 6, 1985. Predicted heavy rain came. Pumping again on fourth hole.

August, 1985. It's getting dry again, water level dropped considerably. Two top holes and two bottom holes on gate now closed, only two middle holes running. Pumping on third hole not bad, still 3240 litres in 24 hours in the garden!

D. & R. V. Fahland, Camerons Pocket, via Calen, Qld, 4741.



Adjustable gate. Approx 60 mm polypipe 'ends' fitted into three sections which can be closed off individually.

Ferrocement tank

By John Vukovich

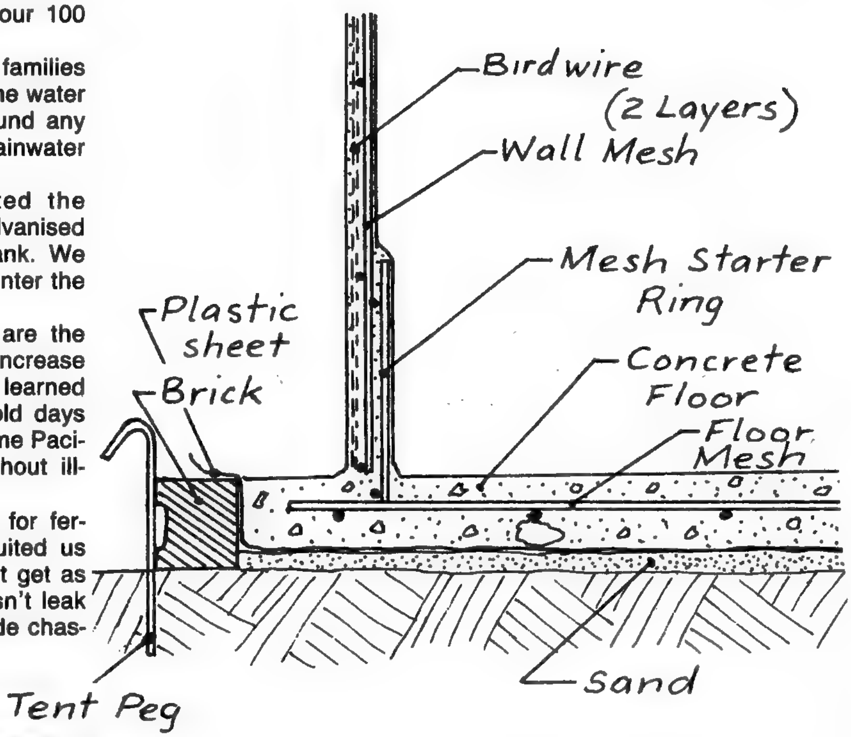
Last year our family (First Mate Helen, 14-years-old, Evan 12, Sonja and I) moved our caravan onto our 100 acres and started working out priorities.

Our limited finances made finding three other families to share the property the top priority, followed by the water shortage. Despite advertising, we still haven't found any families to share our land, but we have built a rainwater tank for a number of reasons:

Firstly, cost. I haven't accurately costed the materials, but I am sure it was cheaper than a galvanised iron tank and much cheaper than a concrete tank. We didn't punch bundy clocks so our labour doesn't enter the costing, although it was considerable.

Secondly, quality. Cement-based products are the only ones I know of which, after adequate curing, increase in strength with age, without maintenance. We had learned to have great faith in this material back in the old days when we cruised our ferrocement yacht around some Pacific Islands and habitually dented coral reefs without ill-effects to its hull.

Thirdly, required skills. The skills required for ferrocement construction are rudimentary, which suited us well. Although the job was pretty rough and didn't get as much curing as I would have liked, the tank doesn't leak and has withstood four kids bouncing around inside chasing each other and tadpoles.



SECTION AT BOTTOM CORNER

The 10 ft diameter ferrocement water tank is also the wall of a bush hut. Feed storage bin in front is also ferrocement.

Design was by "guesstimation" of the minimum reinforcement required and use of what materials were at hand. I had some F52 Weldmesh (200 mm squares of 5 mm rod) and some ½ inch galvanised birdwire, so that was what we used.

Dimensions. The dimensions of the tank were to suit the tank also being used as the south wall of a bush hut, with the roof of the tank being the extension of the hut roof. So the tank ended up being 10 ft in diameter and about 6 ft high, which gave it a capacity of about 3000 gallons of water. The tank floor extended 6 inches past the wall, which turned out to be handy when picking up plaster which fell off the wall during plastering. The thickness of the floor turned out to be about 3½ inches, that is the thickness of a brick on edge, less ½ inch of sand.

Procedure. The site was levelled with mattock and shovel and an 11 ft diameter circle marked on the ground. Bricks on edge were placed around the outside of the circle and some of them were held in place with tent pegs and stakes.

Clear plastic sheeting was laid over the circle (and bricks) with edge laps of about 4 inches. A ½ inch layer of sand was spread inside the circle over the plastic. F52 Weldmesh was laid out with edge laps of about 8 inches and cut to form a circle of 10 ft 8 inches diameter and laid inside the bricks, leaving 2 inches between the bricks and the mesh. A strip of F52 mesh was then cut to a width of 10 inches and laid as a ring with a diameter of 10 ft inside the bricks with a clearance of 6 inches. This ring was wired to the floor mesh to form the starter reinforcement for the wall.

The floor mesh (plus the ring) was lifted about 2 inches and rested on stones to hold it in place before the floor concrete was poured and steel trowel finished. Next day the floor was sealed with slurry made with Silasec and then kept damp with wet bags for a week, during which time we commenced the wall.

F52 Weldmesh for the wall was cut to the required width and placed around the mesh ring projecting up from the floor. This wall mesh was not lapped but at the join 5 mm rods about 2 ft long were wired to each horizontal rod of the mesh. The starter ring was joined in the same way.

The wall mesh was then wired to the starter ring. Two layers of ½ in birdwire were then wrapped around the wall mesh and wired to it where the birdwire bulged away from the mesh. A piece of ¾ inch threaded polypipe was then stuck through the bottom of the wall for the water outlet and a piece of 2 inch polypipe was then stuck through the bottom of the wall for the water outlet and a piece of 2 inch polypipe was stuck through the top of the wall mesh for the overflow pipe. Plastering could now commence.

Plastering. Plaster for the wall was a 3:1 sand/cement mix with the minimum amount of water added to give a plaster which could be easily trowelled. Ours was mixed with a shovel, which I suspect allowed a drier mix, but if we had a motorised mixer we would certainly have used it.

Plastering was started from the bottom of the wall in stages, 18 inches high because the Weldmesh/birdwire reinforcement was flimsy and moved during plastering. Each stage of plastering stiffened up the reinforcement, so that the next stage didn't move too much. Between each stage Bondcrete was painted onto the top of the last stage to ensure a good bond.

Each stage was plastered in three layers. The first layer was trowelled on from the outside with someone inside holding a 2ft square piece of flat iron against the reinforcement to stop the plaster being pushed right through. This layer was rough and had some holes in it, but was needed primarily to form a base for the next layers.

Next day the second layer was plastered on the inside of the first layer and steel trowelled smooth. Next day the inside of that stage was sealed by brushing on Silasec slurry before plastering the outside of the stage with the third layer and finishing it with a wooden float. Each stage was similarly plastered and we attempted to keep each completed stage damp all the time for at least a week.

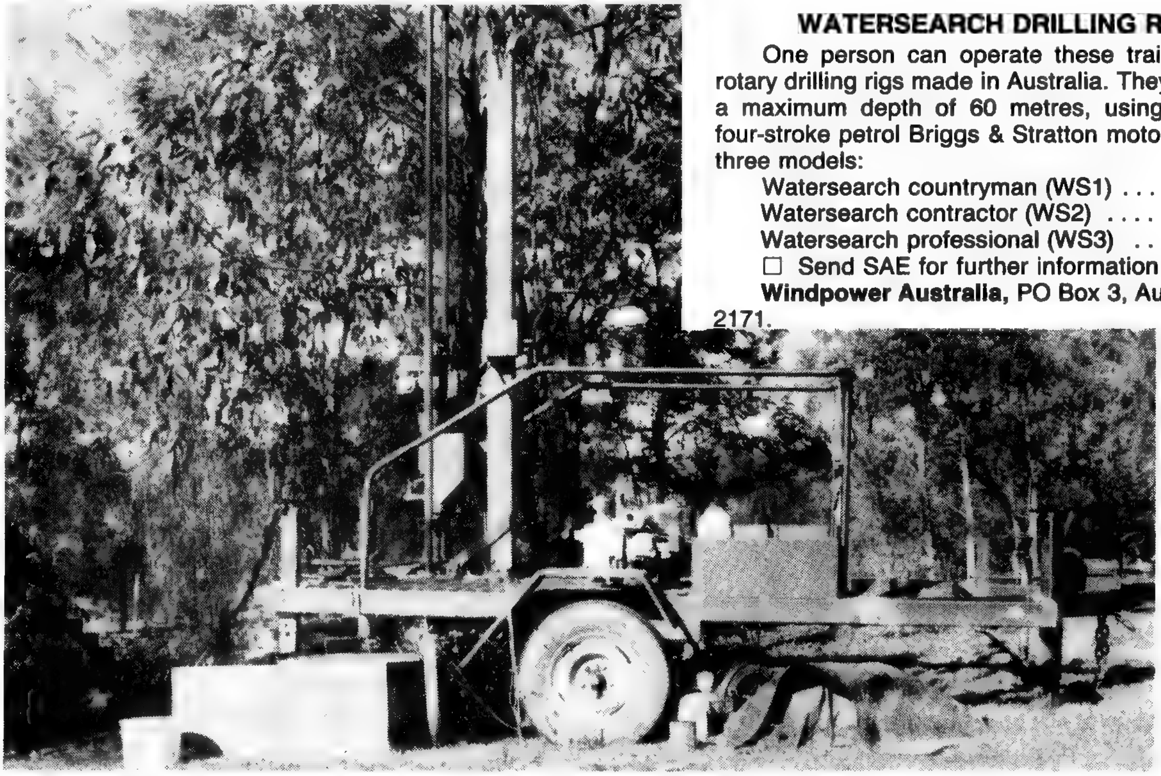
The thickness of the wall was determined by the thickness of the plaster required to cover the reinforcement and turned out to be ¾ inch.

The appearance of the tank is a bit lumpy, but has been improved by the kids' coloured chalk drawings on it.

Roof. The roof of the tank, being an extension of the hut roof, also acts as water catchment, with water entering the tank through a hole in the tank roof. The hut roof is also ferrocement, but that is a different story.

For details about concreting, plastering and reinforcement fixing, I suggest that interested readers ask their local friendly builder, who is sure to know more about these subjects than I do. I doubt that your local friendly builder (or engineer) will approve of this method of tank construction, but our tank is still sitting out there with water in it.

Any queries to me have a fair chance of a reply if a stamped SAE is sent to Olivedale, PO Box 160, South Grafton, NSW, 2461.



WATERSEARCH DRILLING RIGS

One person can operate these trailer-mounted rotary drilling rigs made in Australia. They can drill to a maximum depth of 60 metres, using a 3.5 HP, four-stroke petrol Briggs & Stratton motor. There are three models:

Watersearch countryman (WS1)	$2,990
Watersearch contractor (WS2)	$4,200
Watersearch professional (WS3)	$8,300

☐ Send SAE for further information to:

Windpower Australia, PO Box 3, Austral, NSW, 2171.

Growing firewood

Growing firewood is reprinted from the Department of Agriculture, South Australia, Fact Sheet 18/85, a good example of the high standard typical of this series.

The authors are Brendan Lay and Steve Moore, Senior Research Officers, Department of Agriculture, SA, and Peter Bulman, Manager Native Plants, Murray Bridge, Woods and Forests Department, SA.

☐ Fact Sheets are available from the Department of Agriculture, SA, 25 Grenfell Street, Adelaide, SA, 5000. Send SAE for prices and further information.

There is considerable interest in growing trees as a fuelwood crop. This is because of the large market potential for firewood to supply the increasing number of homes with wood-burning appliances.

Firewood from multiple-purpose woodlots

Many farmers and people with small properties near Adelaide have installed efficient wood-burning appliances. Cutting and storing dead or fallen trees or branches on a property can fuel the wood stove while 'cleaning up' the paddocks and also reducing fire hazards.

Alternatively, firewood can be a by-product of farm woodlots established for other purposes, such as shade, shelter, honey or timber production. This means of obtaining firewood for home use can be cost-efficient where enough land is available (see example below). An average household requirement is about three to five tonnes a year.

Using the figures given below, about 0.5 to 5 ha, depending on site productivity, is required as a minimum woodlot or shelterbelt for permanent firewood self-sufficiency.

Firewood as a cash crop

Much interest has been shown in investing in firewood as a cash crop. The increasing demand and prices of $60 to $70 a tonne now being paid sound very attractive, but this price covers growing, harvesting, transporting and retail marketing costs.

A Department of Mines and Energy report, *Domestic solid fuel use in SA,* covers in detail the firewood and wood-burning appliance industries in South Australia.

Growing the crop

Site Selection. Generally, the most productive agricultural land is also the most suitable for tree growth. However, sites less suitable for conventional agriculture have most appeal for woodlot establishment. These sites include tricky, steep or otherwise non-arable land, or areas with infertile, poorly drained or salty soils. In these circumstances, growth rates can be expected to be slower than on better agricultural sites. For example, even salt-tolerant species grow more vigorously on non-saline sites. However, an exception is that excellent tree growth can be expected from land with high water tables often associated with irrigation areas.

Species such as the eucalypts, which can resprout or copice following cutting or burning, offer the advantage of avoiding re-establishment costs following harvesting or bushfire. Furthermore, the regrowth is generally faster during the second rotation because of the already established root system. It makes good sense to plant species that will have other farm uses if it should prove uneconomical to harvest the trees for firewood in five or 10 years' time.

Advice and information on species selection are available from the Woods and Forests Department.

Site preparation. Thorough weed control using herbidices or cultivation is essential to minimise competition for the first two years if optional growth rates are to be obtained.

Planting density and rotation length

Planting density or spacing significantly influences both the yield and the planting cost.

The optimum rotation length will vary from site to site and between species but will range from five to 15 years if the product is designed for the pot-belly or slow-combustion stove market.

The following table is a guide for planting density and rotation length.

Rainfall (mm)	Spacing (m)	Rotation length (years)
300	5-7	11-15
500	3-5	9-13
700	2.5-3.5	7-11
900	2-3	5-10

Increase the spacing where soils are shallow, or where losses are likely to occur in drought years. It is wise to have at least some rows wide enough for logging access for firebreak maintenance.

Other management considerations. Fertilising is very likely to produce a good growth response, especially if applied to a weed-free site, but little is known about whether or not it is economically viable to fertilise.

Thinning (or removing some trees after four to 12 years) should not be required if the initial spacing at planting is appropriate. However, thinnings from woodlots or plantations grown for larger poles or sawlogs can be used for fuelwood.

Harvesting and marketing

Consider who will fell the trees, how they are to be removed from the woodlot, stored for air drying, loaded and transported to the market place. Unless the woodlot owner is prepared to tackle this task, it would be wise to contact local harvesting contractors and woodyards prepared to handle the future firewood crop.

Yields. The most meaningful way to measure firewood yield is in harvestable dry weight a hectare (dry weight is wood air-dried to about 10 per cent moisture content). This figure will be much less than the green weight harvested and even less again than the total green weight production on the site because of logging residues (branches less than 5 cm in diameter are not saleable). The dry weight a hectare will vary between species and degree of use. Yields quoted as volume (for example, cubic metres a hectare) should be treated with caution as fast-growing trees often produce timber of low density.

Much publicity has been given to the yields possible from fast-growing eucalypts, such as the Lake Albacutya provenance of River Red Gum (*E. camandulensis),* and Flooded Gum (*E grandis).* When irrigated, or on sites with unconfined aquifers, or in fertile high-rainfall areas, these species can produce yearly up to 20 tonnes (dry weight) of wood a hectare. However, actual yields in SA of these

Effect of weed competition on growth of a two-year-old Red Gum plantation. The stand on the right was kept weed-free over the first summer.

Cutting Coast Grey Box for firewood 12 months after they had been burnt in the 1983 Ash Wednesday bushfires. Note minimum 'trash' with this species. Firewood billets can be cut to size and stacked in the field to dry.

species at harvest are not available.

Trials at Bull Creek (near Meadows, 900 mm rainfall) and Harrowgate (450 mm) with nine-year-old Coast Grey Box (*E. bosistoana)* trees gave the following yield information. (This is a slower-growing species with excellent fire resistance, timber quality and coppicing ability.)

	Tree spacing (m)	Trees/ hectare	Av. dry wood/ tree* (kg)	Yield of dry wood/ hectare (t)	Av. annual increment t/ha/yr	Density of wood kg/m³ green	Density of wood kg/m³ air dry
Harrogate	10 x 10	100	130	13.0	1.44	1 110	920
Bull Creek	2.4 x 3	1 390	56	77.8	8.6		

*more than 5 cm in diameter

The original vegetation reflects the potential site productivity; however, selection of different species and provenances, especially when combined with good weed control at establishment, will result in markedly increased growth rates and yields compared to the native vegetation.

The following table is a guide to the yield range of appropriate species in SA for short rotation:

Annual rainfall (mm)	Annual production of usuable firewood (dry tonnes/ha)
300	0.5-1.5
500	1-3
700	3-8
900	5-15
Supplementary water (Irrigation or shallow groundwater)	8-2

Remember, actual yields at any site in these rainfall zones will depend primarily on species (and provenance) chosen, soil type and degree of weed control during establishment.

Costs and returns

Costs of establishing a firewood crop and ultimate returns a hectare can vary widely. As shown in the following example — firewood growing may be most attractive to those who do not need to cost their own time and who can do most of the work themselves. The examples also show the value of integrating the fuelwood production with other farm uses for trees, and of establishing a multi-purpose woodlot.

At present gross returns to the grower (retail price less marketing cost and margin) are around $45/tonne. Future prices are difficult to predict, but the cost of alternative heating sources (such as gas, coal, electricity) must dictate the upper limit of firewood prices).

The following table is one example showing the processes used in evaluating a firewood growing project.

Example

Two hectares of well-drained fertile country, 70 km from Adelaide with 900 mm annual rainfall, on a grazing property, planted with River Red Gum (Lake Albacutya provenance) as a shelterbelt 20 m wide and 1 km long next to existing fencelines. It is to be harvested on a 10-year rotation for supplementary income, but using non-costed grazier's labour.

Item	Cost/ha	Remarks
Land	Nil	No loss of earning capacity as shelterbelt increased livestock productivity
Seedlings	$160	Self propagated 1 600/ha @ 10c each for materials
Site preparation and planting	$150	Ripping, herbicide and hand planting
Weed control (after planting)	$100	Four inter-row cultivations over two years
Fencing	$600	½ km @ $1 200/km for materials
Felling and loading	$300	Own labour, saw and tractor
Transportation	$700	Own truck @ 50c/km
Total	$2 010	
Gross return	$4 500	
Net, before tax	$2 490	**Profit**

Multiple Occupancy

MULTIPLE OCCUPANCY IN NSW

This brochure is reprinted with permission from the NSW Department of Environment and Planning.

Multiple occupancy settlements will be permitted in most rural areas of New South Wales under the draft terms of a proposed new State environment planning policy released by the Department of Planning and Environment.

NSW Minister for Planning and Environment, Mr Bob Carr, said the draft policy would replace guidelines on multiple occupancy issued to local councils in 1980.

"Multiple occupancy is defined as the building of more than two homes on a piece of rural land in single ownership," Mr Carr said. "It is often associated with alternative lifestyles and a number of rural communities have been established, particularly in the North Coast region."

The draft policy seeks to provide opportunities for low income households to pool their resources for building a number of homes on a single property, co-operatives or extended family enterprises to establish diverse agricultural operations and urban and rural unemployment to create self-employment schemes.

What is Multiple Occupancy?

Multiple occupancy is a type of rural development where a group of people, not necessarily related to each other, live on a single rural property in several dwellings.

The intentions of the groups concerned vary widely, but usually they have the following common desires:

- to live as a community and erect a number of dwellings in a rural setting on unsubdivided land;
- to manage the land for communal purposes in an environmentally sensitive way; and
- to enable people, particularly those on low incomes, to pool their resources to develop communal rural living opportunities.

Farming is not necessarily intended as the primary source of income.

Multiple occupancy developments occur where the major part of the property is held in common ownership and management, most of the residents are owners or participants in its management and the property is their principal place of residence. Various forms of legal title are permissible but subdivision of the land, including strata subdivision under the Strata Titles Act, 1973, is prohibited.

Types of Housing on Multiple Occupancy Properties

Housing arrangements on multiple occupancy properties may vary from dispersed single family dwellings to clusters of expanded houses where groups of buildings function as a dwelling house, with shared facilities such as a kitchen and bathroom. Figure 1 is an example of an expanded house.

"Clustered" and "dispersed" settlements are two forms of development. These are shown diagrammatically in Figure 2.

In both forms of development not less than 80 per cent of the total land area must be available for common use.

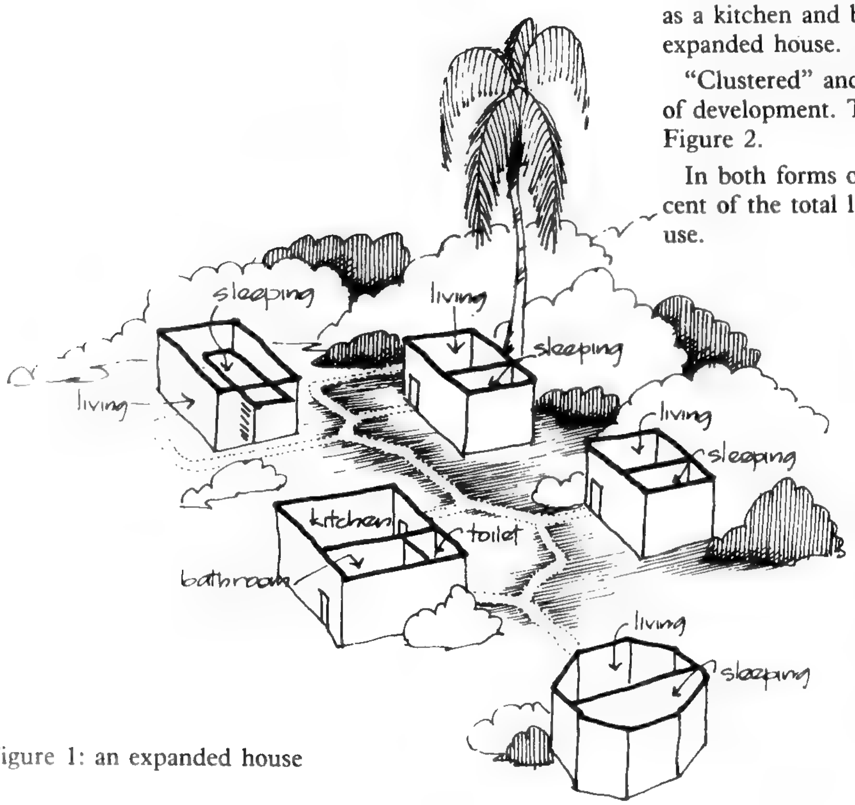


Figure 1: an expanded house

SUBMISSIONS

Submissions and comments on the proposed multiple occupancy policy from councils, community groups and individuals are welcomed by the NSW Department of Environment and Planning.

Send written submissions to: The Secretary, Department of Environment and Planning, PO Box 6, Grafton, NSW, 2460. The Department's head office is at 175 Liverpool Street, Sydney, NSW 2000.

Where Would Multiple Occupancy be Allowed?

Multiple occupancy is now permissible in only a few areas of New South Wales. The existing policy, introduced in 1980, is not mandatory and very few councils have adopted it. The proposed policy, however, will establish a statutory framework which will allow multiple occupancy developments in most rural areas of the State.

The only areas where it could not be carried out are:

- around Sydney, Newcastle and Wollongong;
- land not zoned rural;
- land which is a national park, State forest, State recreation area, Crown reserve, water catchment area, environmental protection area and other similar zones or uses; and
- land protected or to be acquired under the Coastal Lands Protection Scheme.

Multiple occupancy would be permissible in areas classified by the Department of Agriculture as prime crop and pasture land so long as dwellings and non-agricultural buildings are not themselves located on such lands.

How to Apply for Multiple Occupancy

Under the proposed policy, people wanting to pursue multiple occupancy would make a development application to their local council. In considering the applications, councils would be required to assess matters such as road access, water supply, bushfire protection, waste disposal, potential hazards, vegetation conservation, visual impact, community facilities on and off the land, proposed siting of buildings, the need for related uses, and if the council has identified the land for future urban or rural residential expansion.

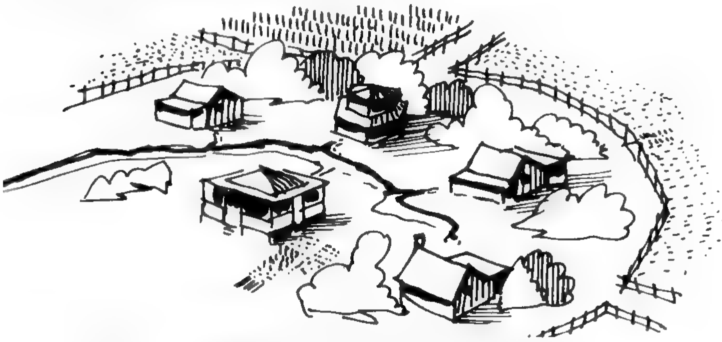
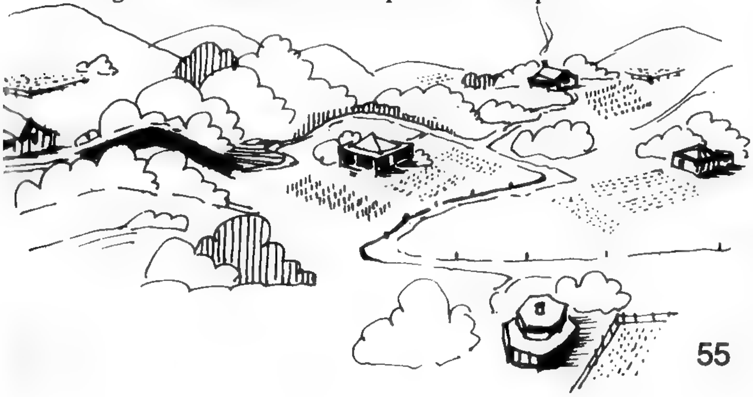


Figure 2: clustered and dispersed development



Where more than four dwellings were planned, a map showing the characteristics of the land and the proposed development would have to be included with the development application. In these cases, a council would advertise the proposal for public comment before determining the application.

If the property consists of several parcels of land, steps should be taken to consolidate these into a single title at the same time as the development application is made.

Development Standards for Multiple Occupancy

The draft policy proposes that the minimum size of land required for multiple occupancy should be 40 hectares.

The maximum density of accommodation on the land would vary according to a formula that has been designed to prevent overdevelopment. For example, on 40 hectares the maximum density is 12 dwellings; for 400 hectares it is 80 dwellings.

Non-residential Development

The draft policy would make it possible to have multiple occupancy for uses other than dwellings and agriculture so long as they are intended primarily to serve the needs of people living on the land, and they are minor in scale.

For instance, schools, community facilities, workshops and visitors' accommodation could be permitted.

Existing Multiple Occupancy Development

Some of the existing multiple occupancy developments have been created without development consent. Often they have been in areas where there are no local planning controls to deal with multiple occupancy. Some of these developments may not meet all the conditions and criteria laid down in the draft policy, especially the provisions on land size.

These communities should register themselves with the Department and provide details of the property, existing development and development proposals. The Department will then work with local councils to consider these cases on their merits through the use of State Environmental Planning Policy No. 1: Development Standards. This allows the development standards such as land size to be varied, where there is good reason.

Have your say

This brochure has been prepared to stimulate informed discussion on the issues raised in the draft policy. More detailed information is also available from the offices of the Department.

Your comments on these issues and on the draft policy itself will help ensure the widest possible range of views are taken into account when the Department considers finalisation of the policy.

Mudbrick render

by David MacMunn

When I wrote my last article on our mudbrick adventures (**Mudbricks become walls** in **Earth Garden 45**), I mentioned rendering, which was completed with a coat of Bondcrete and water. This has proved most suitable for our inside walls. There is no dusting from the walls and they can easily be maintained.

However, we have been less than content with the protection given to the outside walls. In sections where the rain invaded regularly, the Bondcrete layer was being eroded, not drastically, but enough to give us visions of the whole wall being rained away.

When we were last in Melbourne we visited a friend of Kerry's father who was also building in mudbricks. We talked, amongst other things, about treating mudbricks against the weather and the builder proceeded with an amazing demonstration. To my amazement, the jet of water splattered off the wall and left no trace that it had been there.

The walls had been treated with a product called Ramset Rainaway. On another section a few drops of water remained on the wall, where the application had been done by brush and not by spray gun as with the first part.

I was sold on it, so we got some sent up to us and started work. One thing about Rainaway is that it cannot be applied over an impervious (waterproof) layer because it needs to penetrate the wall, so before we could apply the Rainaway, we had to remove the painstakingly applied Bondcrete layer. To do this we had to scrub back all the external walls using a scrubbing brush and water, which was a rotten job and took a long time.

Then we were ready to patch the weathered sections, allow them to dry, and recoat with Rainaway. We applied two liberal coats in different directions (as per the instructions).

The result is great. I've intrigued a few friends already with a demonstration of the finished walls. The Rainaway worked out at about $17 for four litres, which is equivalent to most normal paint. It can be applied by brush, roller or spray gun. The protection time, if applied properly, is up to 10 years. It will do me!

P. S. We are in our mudbrick house now and loving it.

☐ **Rainaway masonry water repellent**
Made by Ramset Fastening (Aust) Pty Ltd
Maroondah Highway, Croydon, Victoria, 3136.

OUTLOOK FARM

Dear Irene and Keith,

I am sorry to have to inform any Earth Garden readers who might be interested in coming to Outlook Farm, Kinglake, that a disastrous fire has made it uninhabitable. At this stage we do not know what its future will be.

Helen Meggs, Hon Secretary, Outlook Farm Trust.

WATER WHEEL PUMP

Robert Martin's article **Water wheel pump** in Earth Garden 47 was reprinted with permission from the **Rare Fruit Council of Australia** Newsletter. Our apologies to the Council and editor Jacky Marshall for not acknowledging this with the story.

PHOENIX SEEDS
1985-86 Catalogue

Free from PO Box 9, Stanley, Tasmania, 7331.

For non-hybrid seeds of common and unusual vegetables, herbs, trees and grains. Much of the seed is organically grown.

A new introduction is Quinoa (Chenopodium quinoa), pronounced 'keenawa', a traditional grain used in South America for 7,000 years. Four varieties are available.

According to one researcher, Quinoa comes as close as any vegetable or animal food source to supplying all of the essential life-sustaining nutrients. It is high in protein (av 14%), calcium, iron and is a food source of phosphorus, vitamin E and several of the B vitamins. The leaves are used like spinach (2-4.5% protein) and it is a very useful fodder crop, producing up to 4,000 kg/ha of dry matter.

HELMUT'S HEALTH FOOD BARN

312 Darling Street, Balmain (Sydney).

"Every item is either organically or bio-dynamically grown," says Janice Moore of the produce for sale at Helmut's, an organic fruit and vegetable supermarket inside a health food store in the Sydney suburb of Balmain.

"We aim for totally chemical free produce. The least standard we will accept is "minimum residue", where only bio-degradeable sprays have been used, and the fruit is not picked until even that has had time to desperse."

access

PERMACULTURE DESIGN COURSE
April 2-16, 1986 at Stanley, Tasmania

This course, taught by Bill Mollison, covers all aspects of permaculture design and management for households, small and large properties and urban centres. It will include site analysis and planning, water, soils, plants, animal forage systems, appropriate house and shelter designs, alternative economic and legal strategies, village development and urban designing.

☐ Contact Reny Slay, Permaculture Institute, PO Box 96, Stanley, Tasmania, 7331. Phone: (004) 58 1142.

PESTICIDE ACTION GROUP

Secretary, RMB 253A Baldivis Road, Baldivis,
via Kwinana, WA, 6167

This active new Western Australian group meets regularly on the third Thursday of each month at the Fremantle Education Centre, Cantonment Street (corner of Edward Street), Fremantle, at 8.00 pm. Membership of $10.00 per family or $8.00 single includes a quarterly newsletter. Membership runs from April-April.

more letters

Dear People,

I have been reading **Earth Garden** for many years now and knowing the diversity of people it reaches, I am hoping to find someone who can help me.

I have my grandmother's treadle **Singer** sewing machine which is a family 'heirloom', having passed from Gran to my mother to me, providing each of us with many years of service. If I can replace the part that has broken down it will be ready for more and my mending pile will go down at a faster rate than my hand-sewing can manage.

The machine is about 60 years old and the number is Y166 2129. The part is the leaf spring, which is the part of the outer bobbin case, and its number is 32953. This number is important as so many models were being made about that time and only the one part fits.

I will pay any reasonable price to obtain this part. I would also be grateful if anyone could contact me if they have any ideas where I might try to find it. Hoping to hear from someone.

Kate Prout, C/- PO Hidden Valley, Paluma, Qld, 4816.

Dear readers,

My wife and I have just finished reading **Earth Garden 47** (we get it a bit late up here in the NT). Although I have got all the magazines, this is the first time I have plucked up enough courage to write to you. Shirley and I are both in our early 40s. I am officially classified by the Government as an invalid pensioner (this is due to a bad back which stops me doing full-time work, but doesn't stop me from pottering around, doing the gardening and odd jobs that need to be done).

We left Tasmania in July 1984, having sold up everything, including livestock, and packing the rest (quite a lot) into our Landrover and caravan. We were starting a new adventure, as we had never been out of Tasmania before and wanted to see the rest of Australia. We were scared stiff and didn't know what was in store for us. It was a slow trip (so slow, that at one stage we were passed by a funeral!).

We stayed with one of our daughters in Melbourne till after Christmas. Not keen on the fast way of life there and wanting a warmer climate, we were persuaded by our daughter in Darwin to visit her. So we packed up and moved on to Adelaide at the end of January. We had to wait a week to catch the train to Alice Springs as we were advised not to drive through. The train fares took the last of our savings.

We arrived in Darwin towards the end of the Wet season. Well, we wanted heat and we've got it. Too much. Seems like we're always complaining, but you don't know what a place is like until you find out for yourself. At present we are caretaking a small property at Humpty Doo, just outside Darwin. We will be here until the owners come back from their holidays in the south, which will be about the end of March or early April. Then we are going to head off again, across Queensland and down the coast to end up (we hope) in north-west NSW.

When we left Tasmania we had such high hopes. We had enough money for a small deposit on our dream home (a small place with some land, so we could live peacefully and grow what we wanted), but unforeseen circumstances, such as health problems, mechanical repairs and fares, have cut our cash reserve to zero. Being a pensioner, it is impossible to obtain a financial loan, so it looks like we are doomed to a lifetime of renting, low cost leasing or caretaking. We are not complaining (much). At least we have each other and what we do have is all paid for, but we would like to settle down somewhere on a place we could jokingly call our 'own'.

So if there is anyone out there with a property with some sort of power and water on our intended route to rent, lease or caretake, and if you think we might be suitable fot it, please drop us a line. All letters will be answered.

Dick & Shirley Crawford, C/- PO Casuarina, NT, 5792.

Dear Earth Garden,

In the May issue of **Earth Garden** (EG 46) I was very interested in **The $300 super loo** composting toilet.

I an an organic worm farmer and I would like to hear from people who would be interested in experimenting with worms in their composting 'loos'. The organic red worm should thrive in this environment, muffle the odours as they deposit their castings on the surface and greatly hasten the composting process, producing vermicompost, a far superior compost. I see no reason why the worms should not be used in both chambers at the same time.

I feel the old pit toilet would also be greatly improved with the addition of some red worms.

We have the conventional septic system which developed the usual hard crust on the surface. About six months ago I threw in a handful of worms and to my surprise they are multiplying and eating their way through an unusual diet of mainly fat, toilet and paper soapsuds.

Yours sincerely, Mick Allison, Wormborough Farm, PO Box 794, Taree, NSW. 2430.

Dear Keith & Irene,

This is my first real try at gardening and I find your magazine a great source of inspiration. Living in the Pilbara makes gardening a very great challenge, with very little water and too much sun. I'm coming to grips with it all though.

Kindest regards, Linda Hopperton, Karratha, Western Australia.

Dear Linda — Jeanette Conacher's article **Organic Methods for the West** in Earth Garden 30 (organic growing guide) should help you with natural ways of dryland growing — Keith & Irene.

Dear friends,

We have only just discovered your magazine and our only complaint is that it isn't published often enough. It is an extremely informative magazine. We are trying to become as self-sufficient as possible and your EG has many ideas.

We have one question, but perhaps it's not up your alley? Would you have any information or know where to get it on a wood/gasifier to power engines? We would like to connect our vehicle to a gasifier. Forty years ago it was a common sight, but we are having difficulty getting information on this.

Most people would just as soon tank up at the service station, but for the price of petrol now and the availability of wood, we are seriously considering a conversion. And there's no pollution too.

Jakob & Ricki Eugster, PO Box 147, Moura, Qld, 4718.

Dear Jakob & Ricki — Wood gas (or producer gas) generation is certainly right up our renewable energy alley and we published an excellent article, **Grow your own fuel!** by A. H. Ellis in **Earth Garden 13** (now out of print). We plan to run some more recent material on the subject soon. However, as far as we know, no new generator units are on sale, so you must either build your own or buy a World War II vintage model. Secondly, wood gas exhaust and leaks from the engine or generator are extremely polluting — pure carbon monoxide — and killed many drivers during petrol rationing in Finland during the war — Irene & Keith.

Dear Irene and Keith,

We have had the usual hectic year so far. John is still extending the house with mudbricks and secondhand building materials (see **Ten good years** in EG34). We still have assorted sheep, chooks and three beehives. We haven't renewed our commitment to a cow at this stage. Our lives have become busier as we involve ourselves with the activities of three children, school, kindergarten and playgroup.

Out extensions include an open fireplace and the current project is the planting of a woodlot — how's that for forward planning? Firewood is becoming harder to get, even here on the edge of the bush, so we reckon we ought to aim at providing our own in the future. At present we've planted quick-growing Tasmanian bluegums and plan to extend the range. The trees should be able to be coppiced in about seven or eight years.

The herb garden and young orchard are growing well and an automatic sprinkler system has changed our summer tree care drastically.

Sincerely, Margaret Scott, Horsham, Victoria

Dear Margaret and John — We think planting a woodlot is a great idea. That's why we've run the article on Growing firewood in this issue (page 52).

E.G. lives!

Dear friends,

This is the first issue of **Earth Garden** which includes advertising. After much deliberation we (and it seems most of you) thought it better to abandon our long standing tradition and take appropriate ads rather than increase our cover price. The added income should offset increased costs of production, so we are now able to offer the 1986 subscription (EG49-EG52) at the same price, that is $11.00, still post free.

Our new 'unclassifieds' section should be a useful service for readers. At $12.00 (flat rate) for 50 words (maximum) it's a good way to let Earth Garden people know about goods and services, publications, livestock and other topics which fit into the philosophy of self reliance.

As this is the last issue of the year, most subscriptions are due for renewal, so please fill in the 1986 subscription form at the bottom of the page now. We are not able to include coloured renewal slips as we have in past years, so please regard this as your personal reminder. Subscribers are sustainers!

Good news! **Energy Works!** is on sale now in bookshops and available from us by mail. This guide to making your own electricity with sun, wind and water energy is a large format, quality paperback book of over 200 pages, well illustrated with diagrams and photos. Its retail price is $19.95 and as a special introductory offer, we'll send it to you post free. More details inside the front cover.

Not such good news is that **Earth Garden 13** is out of stock and cannot be reprinted, so it is no longer included in back issue sets. The 'big packet' now contains issues EG1 to EG12 and EG14 to EG48 (plus EG49-EG52 as published) and costs $90.00, a saving of around $25.00. A few other issues are running low, so order soon if you have numbers missing from your EG library.

We still have copies of **The Illustrated Herbal** at our bargain offer of $5.50 posted in Australia. We can send them to your friends with a Christmas message on your behalf.

Peace & love, Irene & Keith

BOOKS & ISSUES

EARTH GARDEN, PO Box 378, Epping, NSW, Australia, 2121

Prices include postage within Australia.

BOOKS

ENERGY WORKS! — $19.95 .... $..........

The Settler's Guide — $15.95 .... $..........

The Essential Earth Garden — $15.95 .... $..........

Illustrated EG Herbal — $5.50 .... $..........

First Earth Garden Book — $9.00 .... $..........

Third Earth Garden Book — $9.00 .... $..........

HARD TIMES HANDBOOK — $7.50 .... $..........

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1986: EG49-EG52 — $11.00 .... $..........

1985: EG45-EG48 — $11.00 .... $..........

The lot: EG1-EG52 (excludes EG13) — $90.00 (save $25) .... $..........

Single issues: EG45-EG52 — $2.75 each .... $..........

EG33-EG44 — $2.50 each .... $..........

EG26-EG32 — $2.25 each .... $..........

EG1-EG12/EG14-EG21/EG24 — $2.00 each .... $..........

(EG13 is out of print)

Name ....

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No need to cut this page, just send us the details in a letter if you prefer.

1986 SUBSCRIPTION

Please post me:

☐ **1986 Subscription (EG49-EG52). I enclose $11.00**

☐ **EG51 & EG52. I have already subscribed to EG50. I enclose $5.50.**

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EARTH GARDEN BOOKS

. . . for self reliance. They make great gifts too!

The Illustrated EARTH GARDEN HERBAL

Compiled by Keith Smith

Nelson, large format paperback, 157 pages, 120 woodcuts. Special price $5.50 posted.

This quality book, printed on fine white paper, is an ideal gift for anyone who loves herbs and gardens, or the classic 16th century herbals about them. Covers fact, fantasy & folklore of 40 herbs, with growing tips for Australia and medicinal uses. The herbalists, Dioscorides, Pliny, Strabo, Gerard, Parkinson and Culpeper speak of these beautiful, aromatic plants with delight. Make herb candles, vinegars, oils and salves, conserves and candies.

The Essential Earth Garden

Edited by Keith & Irene Smith

Nelson, Melbourne, 1982, large format paperback, 509 pages, illustrated, index. Price $15.95 posted.

The best of 10 years of *Earth Garden* articles. How to build in mudbrick, rammed earth and stone, grow your own food, keep small livestock, make handcrafts, use solar, wind and water power with many ingenious plans and ideas and lots of inspiration from new settlers. Includes a comprehensive *Access Directory.*

HARD TIMES HANDBOOK

Survive — and thrive!

Keith & Irene Smith

Nelson, 1984, paperback, 204 pages, with 70 illustrations by Elaine Norling, index. Price $7.50 posted.

HARD TIMES HANDBOOK outlines a new, self-reliant approach to city living. How to do more with less, be prepared for blackouts and food shortages, save energy, make money without a job and manage your food supply. Make bread, yoghurt, soft cheese, candles and soap. There are 150 recipes for cheap, healthy tucker and 180 household hints.

First Earth Garden Book

(Best of EG1-EG10)

Keith and Irene Smith

Nelson, large format paperback, 256 pages, illustrated. Price $9 posted.

Keep goats, pigs, fowl, ducks, donkeys and bees. Build your house with stone or mudbricks, grow organic fruit and vegetables, spin & dye your own wool, make a leather bag or belt, weave a hat from bulrushes, make candles or carve a bamboo flute. Meet bush artist Neil Douglas and scores of new settlers. The original book on self-sufficiency in Australia.

The Settler's Guide

Old time skills and bush lore

Compiled by Keith Smith

Nelson, Melbourne, 1983 (second printing), large format paperback, 176 pages, illustrated, index. Price $15.95 posted.

Pioneer a bush block from 'go' to 'whoa'. How to clear, fence, square a gatepost, whitewash, build a slab hut, a rammed earth house or timber windpump, harness horses and select and care for tools like axes, adzes, planes, mauls, crosscut saws and scythes. Tried and true advice from *The Agricultural Gazette* of NSW, 1890-1910.

Third Earth Garden Book

(Best of EG21-28)

Keith and Irene Smith

Nelson, large format paperback, 256 pages, illustrated. Price $9 posted.

Build fences, gates, concrete water tanks, plastic greenhouse, Coolgardie safe and a compost privy. Keep coloured sheep or a bullock team, make rugs, dilly bags and stringybark baskets, tan skins, raise freshwater fish or yabbies, grow tree crops. Learn how Aborigines forage for bush tucker and read Dorothy Hall's ideas on food. Includes selections from our two Access issues.